HEATHKIT® MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information	(616) 982-3411
Credit	(616) 982-3561
Replacement Parts	(616) 982-3571

Technical Assistance Phone Numbers
8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only

R/C, Audio, and Electronic Organs	(616) 982-3310
Amateur Radio	(616) 982-3296
Test Equipment, Weather Instruments and Home Clocks	(616) 982-3315
Television	(616) 982-3307
Aircraft, Marine, Security, Scanners, Automotive, Appliances and General Products	(616) 982-3496
Computers	(616) 982-3309

YOUR HEATHKIT 90 DAY LIMITED WARRANTY

If you are not satisfied with our service - warranty or otherwise - or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

Our attorney, who happens to be quite a kitbuilder himself, insists that we describe our warranty using all the necessary legal phrases in order to comply with the new warranty regulations. Fine. Here they are:

For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, any Heathkit Electronic Center (units of Schlumberger Products Corporation), or any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty does not cover and we are not responsible for damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, or by unauthorized modifications to or uses of our products for purposes other than as advertised. Our warranty does not include reimbursement for customer assembly or set-up time.

This warranty covers only Heathkit products and is not extended to allied equipment or components used in conjunction with our products. **We are not responsible for incidental or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

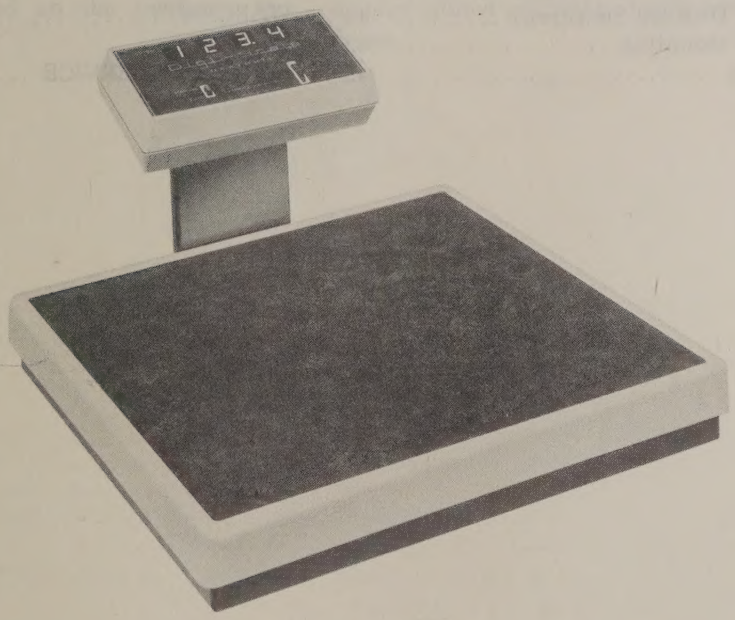
Heathkit® Manual

for the

DIGITAL SCALE

Model GD-1186

595-1948-02



HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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INTRODUCTION

The Heathkit Model GD-1186 Digital Scale is a 4-digit scale designed for home use. The weight is displayed on four 1/2" readouts in a display cabinet. You can mount the display cabinet on either the matching platform assembly, or at some other suitable location, such as a bathroom wall.

The platform assembly houses six standard "C" cell batteries (not supplied) which make external power unnecessary. A "low battery indicator" lights when the batteries need to be replaced.

The Digital Scale features manual and automatic operation. In manual operation, the display is on constantly and the scale will measure weight, as small as .1 pound, placed on the platform. In automatic operation, the display remains off until sufficient weight is placed on the platform, to conserve the batteries.

Several other features of the Digital Scale include:

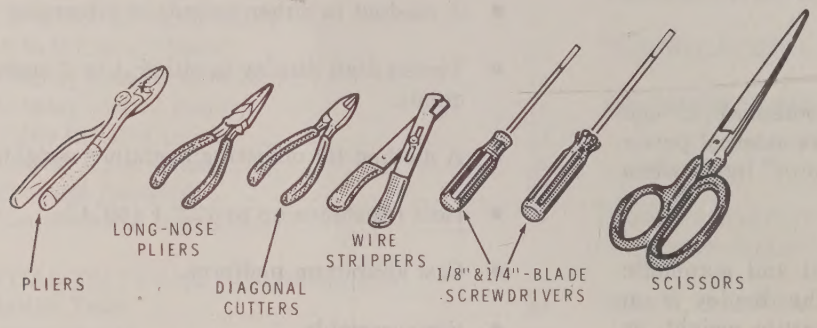
- A preweighed platform top to insure an accurate calibration standard.
- A readout in either pounds or kilograms.
- Tenths digit display in either .1 or .2 increments.
- A method for offsetting container weight.
- Heat resistance up to 122° F (50° C).
- Cast aluminum platform.
- Easy assembly.

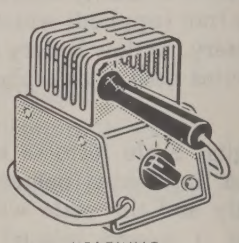
The Digital Scale with its attractive beige and walnut display cabinet will make a handsome addition to any decor.

ASSEMBLY NOTES

TOOLS

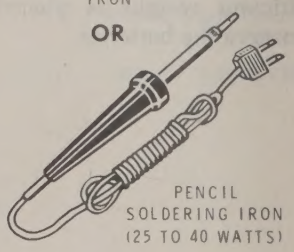
You will need these tools to assemble your kit.





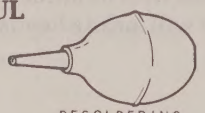
HEATHKIT SOLDERING IRON

OR



PENCIL SOLDERING IRON (25 TO 40 WATTS)

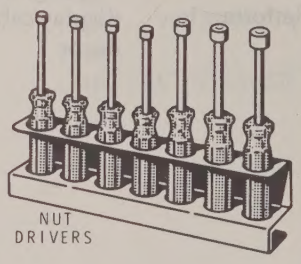
OTHER HELPFUL TOOLS



DESOLDERING BULB*

NUT STARTER (MAY BE SUPPLIED WITH KIT)

DESOLDERING BRAID*



NUT DRIVERS

*TO REMOVE SOLDER FROM CIRCUIT CONNECTIONS.

ASSEMBLY

1. Follow the instructions carefully and read the entire step before you perform the operation.

2. The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.

3. Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.

4. Position all parts as shown in the Pictorials.

5. Solder a part or a group of parts only when you are instructed to do so.

6. Each circuit part in an electronic kit has its own component number (R2, C4, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

   — In the Parts List,

   — At the beginning of each step where a component is installed,

   — In some illustrations,

   — In the Schematic,

   — In the section at the rear of the Manual.

7. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

SAFETY WARNING: Avoid eye injury when you cut off excess lead lengths. Hold the leads so they cannot fly toward your eyes.

SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

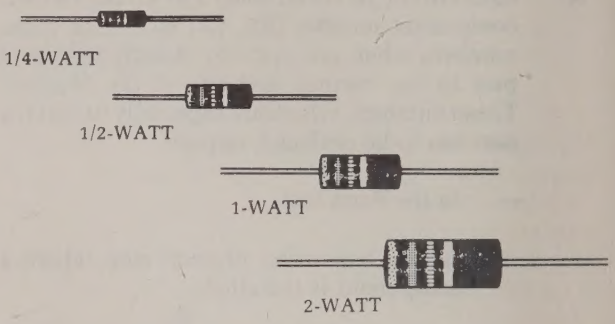
It is easy to make a good solder connection if you follow a few simple rules:

1. Use the right type of soldering iron. A 25 to 40-watt pencil soldering iron with a 1/8" chisel or pyramid tip works best.

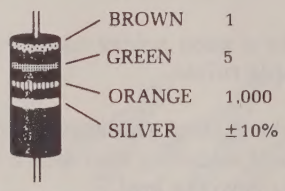
2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

PARTS

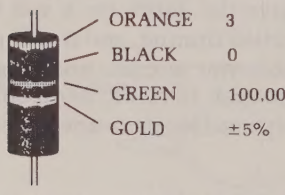
Resistors will be called out by their resistance value in Ω (ohms), kΩ (kilohms), or MΩ (megohms). Certain types of resistors will have the value printed on the body, while others will be identified by a color code. The colors of the bands and the value will be given in the steps, therefore the following color code is given for information only.



EXAMPLES:

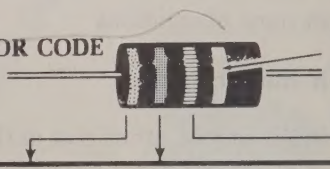


15 × 1,000 = 15,000 Ω (15,000 OHMS), or "15 kΩ"



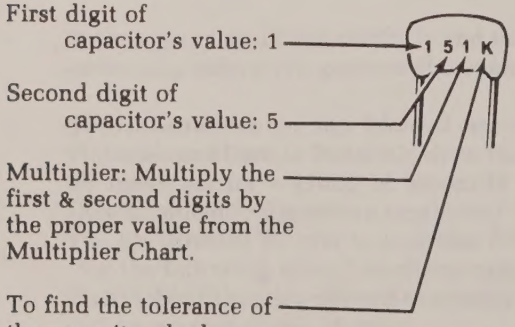
30 × 100,000 = 3,000,000 Ω (or 3 MΩ)
3 MΩ = 3 MEGOHMS

RESISTOR COLOR CODE



COLOR	1st DIGIT	2nd DIGIT	MULTIPLY BY
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000
GOLD			.1
SILVER			.01

Capacitors will be called out by their capacitance value in μF (microfarads) or pF (picofarads) and type: ceramic, Mylar*, electrolytic, etc. Some capacitors may have their value printed in the following manner:


First digit of capacitor's value: 1
Second digit of capacitor's value: 5
Multiplier: Multiply the first & second digits by the proper value from the Multiplier Chart.
To find the tolerance of the capacitor, look up this letter in the Tolerance columns.
1 5 1 K

EXAMPLES:

151K = 15 × 10 = 150 pF
759 = 75 × 0.1 = 7.5 pF

NOTE: The letter "R" may be used at times to signify a decimal point; as in: 2R2 = 2.2 (pF or μF).

MULTIPLIER		TOLERANCE OF CAPACITOR		
FOR THE NUMBER:	MULTIPLY BY:	10pF OR LESS	LETTER	OVER 10pF
0	1	±0.1pF	B	
1	10	±0.25pF	C	
2	100	±0.5pF	D	
3	1000	±1.0pF	F	±1%
4	10,000	±2.0pF	G	±2%
5	100,000		H	±3%
			J	±5%
8	0.01		K	±10%
9	0.1		M	±20%

*DuPont Registered Trademark

PARTS LIST

Check each part against the following list and the Parts Pictorial (Illustration Booklet, Pages 1 and 2). Any part that is packed in an individual envelope with the part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not discard any packing materials until all parts are accounted for.

CAUTION: The integrated circuits packed in conductive foam can be damaged by static voltage. Since these parts represent a considerable portion of the cost of the kit, do not remove them from their packages until you are instructed to do so.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit or at the rear of this Manual. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

NOTE: You will need six standard "C" cell alkaline or dry cell type batteries. Purchase them at this time.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

RESISTORS

NOTE: The following resistors have a tolerance of 10% unless they are listed otherwise. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold fourth band. The resistors may be packed in more than one envelope.

COMPOSITION, 1/4-Watt

NOTE: Composition and film resistors are color coded (color bands) while the rest of the resistors (1%) have the value stamped on the body.

A1	1-92-12	30	330 Ω, 5% (orange-orange-brown)	R101, R102, R103, R104, R105, R106, R107, R108, R109, R111, R112, R113, R114, R115, R116, R117, R118, R119, R121, R122, R123, R124, R125, R126, R127, R128, R129, R131, R132, R133
A1	1-9-12	4	10 kΩ (brown-black-orange)	R7, R12, R13, R34

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

Resistors (cont'd.)

A1	1-41-12	1	33 kΩ (orange-orange-orange)	R9
A1	1-11-12	2	47 kΩ (yellow-violet-orange)	R1, R11
A1	1-32-12	5	100 kΩ (brown-black-yellow)	R5, R6, R8, R16, R35
A1	1-19-12	1	1 MΩ (brown-black-green)	R2

FILM, 1/2-Watt

A2	4-53	1	270 Ω, 5% (red-violet-brown)	R39
A2	4-15	1	1000 Ω, 5% (brown-black-red)	R28
A2	4-47	1	1200 Ω, 5% (brown-red-red)	R31
A2	4-17	1	2200 Ω, 5% (red-red-red)	R29
A2	4-65	1	2400 Ω, 5% (red-yellow-red)	R4
A2	4-63	1	2700 Ω, 5% (red-violet-red)	R32
A2	4-19	1	3900 Ω, 5% (orange-white-red)	R3
A2	4-54	1	5600 Ω, 5% (green-blue-red)	R41
A2	4-34	1	100 kΩ, 5% (brown-black-yellow)	R36
A2	4-31	1	330 kΩ, 5% (orange-orange-yellow)	R15
A2	4-33	2	470 kΩ, 5% (yellow-violet-yellow)	R26, R33

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Resistors (cont'd.)				
1/8-Watt, 1% Precision				
A3	2-34-11	2	330 Ω precision	R17, R18
A3	2-18-11	2	10 kΩ precision	R21, R27
1/4-Watt, 1% Precision				
A4	2-56-12	1	1000 Ω (1k) precision	R37
A4	2-88-12	1	5000 Ω (5k) precision	R38
A4	2-661-12	1	6570 (6.57k) Ω presicion	R24
A4	2-34-12	1	15 kΩ precision	R25
CAPACITORS				
B1	21-6	1	27 pF ceramic	C15
B1	21-75	1	100 pF (100k) ceramic	C2
B1	21-162	1	180 pF ceramic	C1
B1	21-56	1	470 pF ceramic	C11
B1	21-140	4	.001 μF ceramic	C3, C6, C7, C12
B1	21-26	1	.003 μF ceramic	C5
B2	25-253	3	33 μF tantalum (may be marked 33 M)	C13, C14, C16
B3	27-62	2	.68 μF Mylar*	C8, C9
DIODE-TRANSISTORS-IC'S				
C1	56-613	1	4.7 volt zener diode	ZD1
C2	411-819	4	FND-500 LED display	V201, V202, V203, V204

NOTE: Transistors (and integrated circuits) are marked for identification in one of the following four ways:

1. Part Number.
2. Type number. (On integrated circuits, use **only** those numbers and letters in **BOLD** print. Disregard any others numbers or letters).
3. Part number and type number.
4. Part number with a type number other than the one shown.

C3	417-235	2	2N4121 transistor	Q1, Q101
C4	417-818	1	MJE181 transistor	Q201
C5	442-66	2	LM**308**N integrated circuit	IC5, IC6
C5	442-639	1	LM**308A**N integrated circuit	IC3
C6	442-99	1	CD**4016** integrated circuit	IC4
C6	442-616	1	LM**3302**N Integrated circuit (May also be LM**2901**N or UA**775**)	IC1
C6	443-607	1	CD**4013**AE integrated circuit	IC2
C6	443-699	4	MM**14511** integrated circuit	IC101, IC102, IC103, IC104
C6	443-737	2	MC**14518** integrated circuit	IC105, IC106
CONTROLS-SWITCH				
E1	10-382	1	2000 Ω control	R19
E1	10-389	1	100 kΩ control	R14
E2	10-1083	1	10 kΩ control	R134
E3	60-618	1	Slide switch	SW101
E4	65-65	1	Leaf switch	SW201
TERMINAL STRIP-CONNECTOR				
F1	431-49	1	11-lug	
F2	432-134	2	Connector pin	
SOCKETS				
G1	434-266	3	8-pin	
G2	434-267	3	14-pin	
G3	434-268	6	16-pin	
G4	434-292	8	5-pin	
GENERAL				
H1	73-39	6″	1/4″ foam tape	
H1	73-77	1′	3/8″ foam tape	
H2	73-92	5″	Double-stick foam tape	
H3	75-124	1	Insulating paper	
H4	75-138	5	Rubber foot	
H5	258-30	2	Battery spring	
H6	266-805	4	Clamp	
H7	266-912	2	Ring	
H8	390-1344	1	Decorative label inlay	
H9	390-1353	1	Decorative label	
H10	446-681	1	Window	
H11	391-34	1	Blue and white label	

*DuPont Registered Trademark

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

HARDWARE

NOTES:

1. The hardware may be packed in more than one packet. Open all the hardware packets in this pack before you check the hardware against the Parts List.

2. The hardware is shown full size. To identify a part, place it on its drawing.

#3 HARDWARE

J1	250-133	2	3-48 × 7/16″ brass screw

#4 HARDWARE

J2	250-273	1	4-40 × 3/8″ screw
J3	250-1171	4	#4 × 1-1/8″ screw
J4	250-1218	2	#4 × 7/16″ self-tapping screw
J5	252-2	1	4-40 nut
J6	254-9	2	#4 lockwasher

#6 HARDWARE

J7	250-56	8	6-32 × 1/4″ screw
J8	250-26	6	6-32 × 5/8″ screw
J9	250-252	2	#6 × 5/8″ bronze hex-head screw
J10	252-3	6	6-32 nut
J11	254-1	6	#6 lockwasher

#8 HARDWARE

J12	250-329	6	8-32 × 5/8″ screw
J13	250-1186	2	8-32 × 3/8″ black screw
J14	252-78	4	8-32 nut
J15	253-13	8	#8 fiber shoulder washer
J16	253-45	2	#8 flat washer
J17	259-2	4	#8 solder lug

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

WIRE-SLEEVING-CABLE

	344-50	2′	Black wire
	344-52	2′6″	Red wire
K1	346-5	2″	Large sleeving
K2	346-19	1″	Small sleeving
	347-55	1′6″	Multi-colored 8-wire cable
	347-61	7′	Brown 8-wire cable

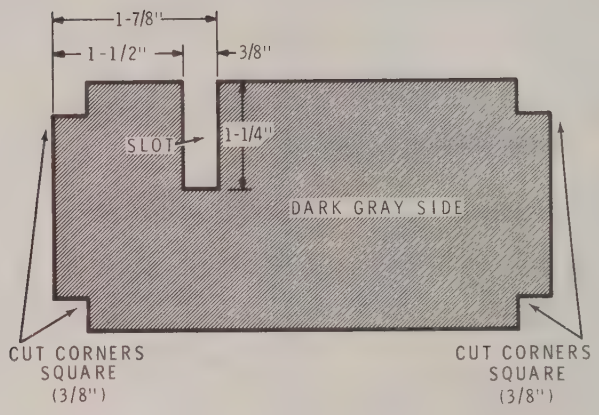
METAL PARTS

L1	201-65-1	1	Platform bottom
L2	201-64-1	1	Platform top
L3	204-2235	4	"U" bracket
L4	204-2236	4	"L" bracket
L5	204-2237-1	1	Support bracket
L6	205-492	1	Cable retainer
L7	205-1707	4	Pivot plate
L8	205-1710	2 pair	Lever arms (2 long, 2 short)

MISCELLANEOUS

	85-1891-1	1	A to D circuit board
	85-1892-1	1	Display circuit board
M1	305-45	1	Display cabinet assembly (consists of cabinet top, bottom, and pivot)
M2	100-1701	1	Transducer
	349-1	1	Cord
M3	352-13	1	Silicone grease
M4	490-5	1	Plastic nut starter
M5	490-111	1	IC puller
M6	490-168	1	Wrench
	597-260	1	Parts Order Form
			Solder
			Assembly Manual (See Page 1 for part number)

STEP-BY-STEP ASSEMBLY



PICTORIAL 1-1

Refer to Pictorial 1-1 for the following steps.

( ) Position the insulating paper on your work area with the gray side facing up.

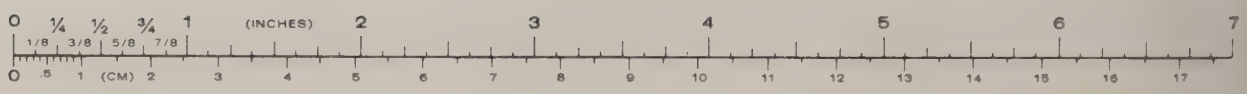
( ) Place the A to D circuit board (#85-1891-1) over the insulating paper with either side facing up.

( ) Use a pencil and trace the outline of the circuit board on the insulating paper. Then remove the circuit board.

( ) With a pencil and a ruler, mark the slot dimensions on the insulating paper.

( ) Use a pair of scissors or a single-edged razor blade and cut the insulating paper along the pencil lines. Cut the indented corners square instead of round. **DO NOT** remove the paper backing.

( ) Set the prepared insulating paper aside. Save the remaining insulating paper for later use.



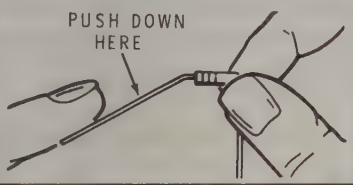
A to D CIRCUIT BOARD ASSEMBLY

START

In the following steps, you will be given detailed instructions on how to install and solder the first part on the circuit board. Read and perform each step carefully. Then use the same procedure whenever you install parts on a circuit board.

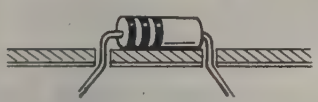
( ) Position the circuit board as shown with the printed side (not the foil side) up.

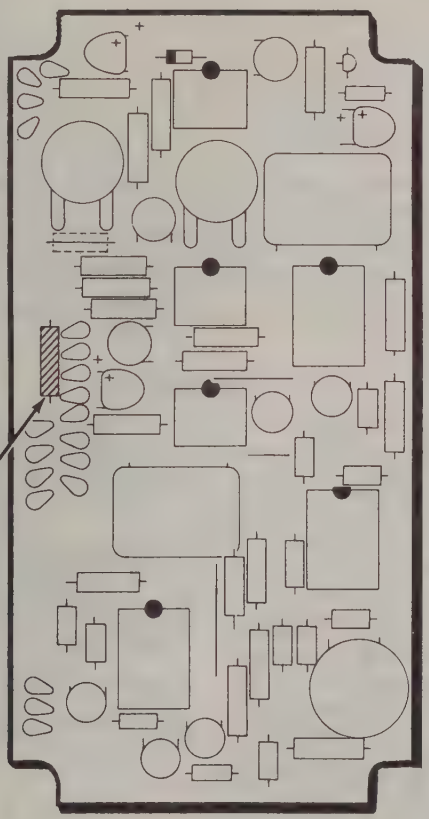
( ) R15: Hold a 330 kΩ, 5% FILM (orange-orange-yellow) resistor by the body as shown and bend the leads straight down.



( ) Push the leads through the holes at the indicated location on the circuit board. The end with color bands may be positioned either way.

( ) Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.



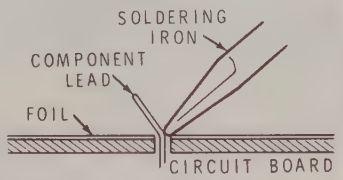


PICTORIAL 1-2

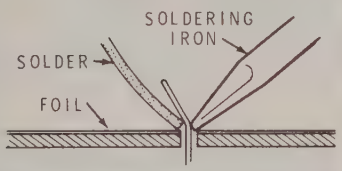
CONTINUE

( ) Solder the resistor leads to the circuit board as follows:

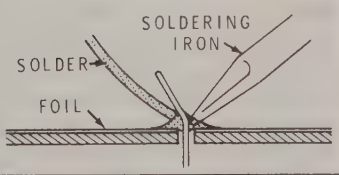
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat **both** for two or three seconds.



2. Then apply solder to the other side of the connection. IMPORTANT: Let the heated lead and the circuit board foil melt the solder.



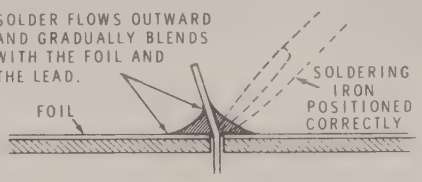
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



( ) Cut off the excess lead lengths close to the connection. WARNING: Clip the leads so the ends will not fly toward your eyes.

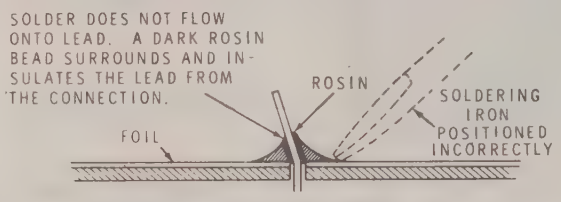
( ) Check the connection. Compare it to the Illustration on Page 12. After you have checked the solder connections, proceed with the assembly on Page 13. Use the same soldering procedure for each connection.

A GOOD SOLDER CONNECTION

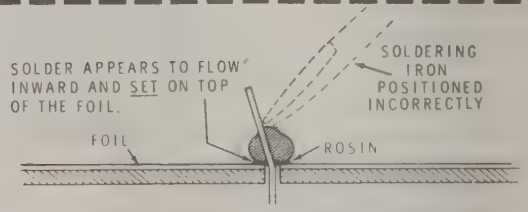


When you heat the lead and the circuit board foil at the same time, the solder will flow evenly onto the lead and the foil. The solder will make a good electrical connection between the lead and the foil.

POOR SOLDER CONNECTIONS


SOLDER DOES NOT FLOW ONTO LEAD. A DARK ROSIN BEAD SURROUNDS AND INSULATES THE LEAD FROM THE CONNECTION.
ROSIN
FOIL
SOLDERING IRON POSITIONED INCORRECTLY

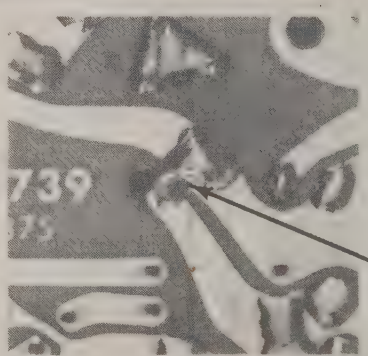
When the lead is not heated sufficiently, the solder will not flow onto the lead as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.



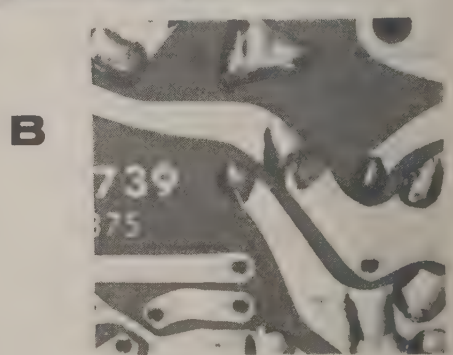
When the foil is not heated sufficiently the solder will blob on the circuit board as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

SOLDER BRIDGES

A solder bridge between two adjacent foils is shown in photograph **A**. Photograph **B** shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. A good rule to follow is: always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together. NOTE: It is alright for solder to bridge two connections on the same foil.



Use only enough solder to make a good connection, and lift the soldering iron straight up from the circuit board. If a solder bridge should develop, turn the circuit board foil-side-down and heat the solder between connections. The excess solder will run onto the tip of the soldering iron, and this will remove the solder bridge. NOTE: The foil side of most circuit boards has a coating on it called "solder resist." This is a protective insulation to help prevent solder bridges.



START

NOTES:

1. In some of the following steps, you will install different types of resistors of the same value. Install the film resistors and the 1% precision resistors **only when you are specifically directed to do so in a step.** Refer to the "Parts Pictorial" in the "Illustration Booklet" to correctly identify a resistor.

2. Bend the leads of each precision resistor so they will fit into the proper holes and the value will be visible.

( ) R38: 5000 Ω (5 k), 1/4-watt 1%.

( ) R37: 1000 (1 k), 1/4-watt 1%.

NOTE: If you would like your scale to read in pounds, install the following resistor. If you would like your scale to read in kilograms, disregard the resistor and install a 1" bare wire. When you prepare a bare wire in any of the following steps, cut a red wire to the indicated length and remove the insulation.

( ) R21: 10 kΩ, 1/8-watt 1% (lbs).

OR

( ) 1" bare wire (kg).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R36: 100 kΩ, 5% **film** (brown-black-yellow).

( ) R17: 330 Ω, 1/8-watt 1%.

( ) R18: 330 Ω, 1/8-watt 1%.

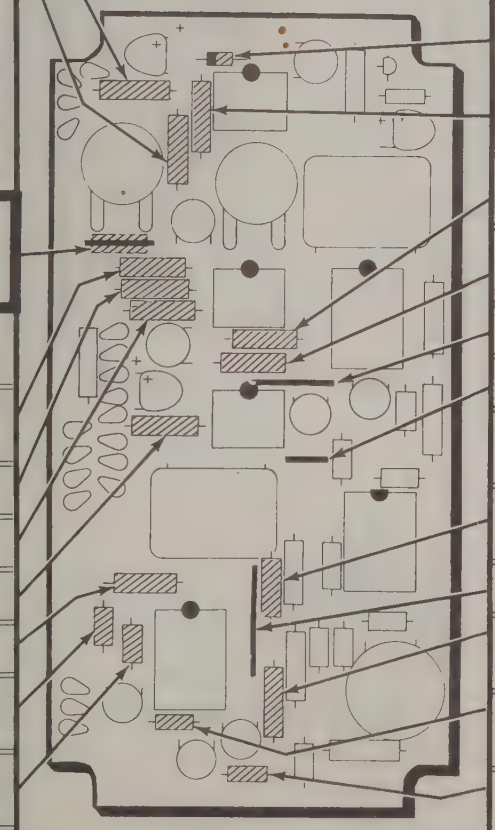
( ) R27: 10 kΩ, 1/8-watt 1%.

( ) R25: 15 kΩ, 1/4-watt 1%.

( ) R6: 100 kΩ, 1/4-watt (brown-black-yellow).

( ) R7: 10 kΩ, 1/4-watt (brown-black-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 1-3

CONTINUE

NOTE: When you install a diode, always match the band on the diode with the band mark on the circuit board. A DIODE WILL NOT WORK IF IT IS INSTALLED BACKWARDS.

IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.

BANDED END

( ) ZD1: 4.7 V (#56-613) zener diode.

( ) R39: 270 Ω, 5% **film** (red-violet-brown).

( ) R24: 6570 Ω (6.57 k), 1/4-watt 1%.

( ) R26: 470 kΩ, 5% **film** (yellow-violet-yellow).

( ) 1" bare wire.

( ) 3/4" bare wire.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R29: 2200 Ω, 5% **film** (red-red-red).

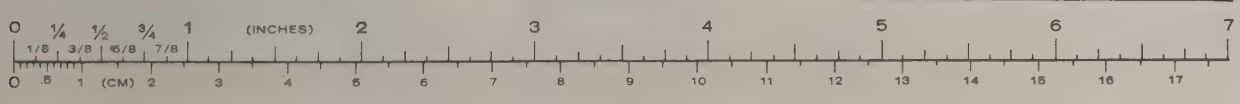
( ) 1-1/4" bare wire.

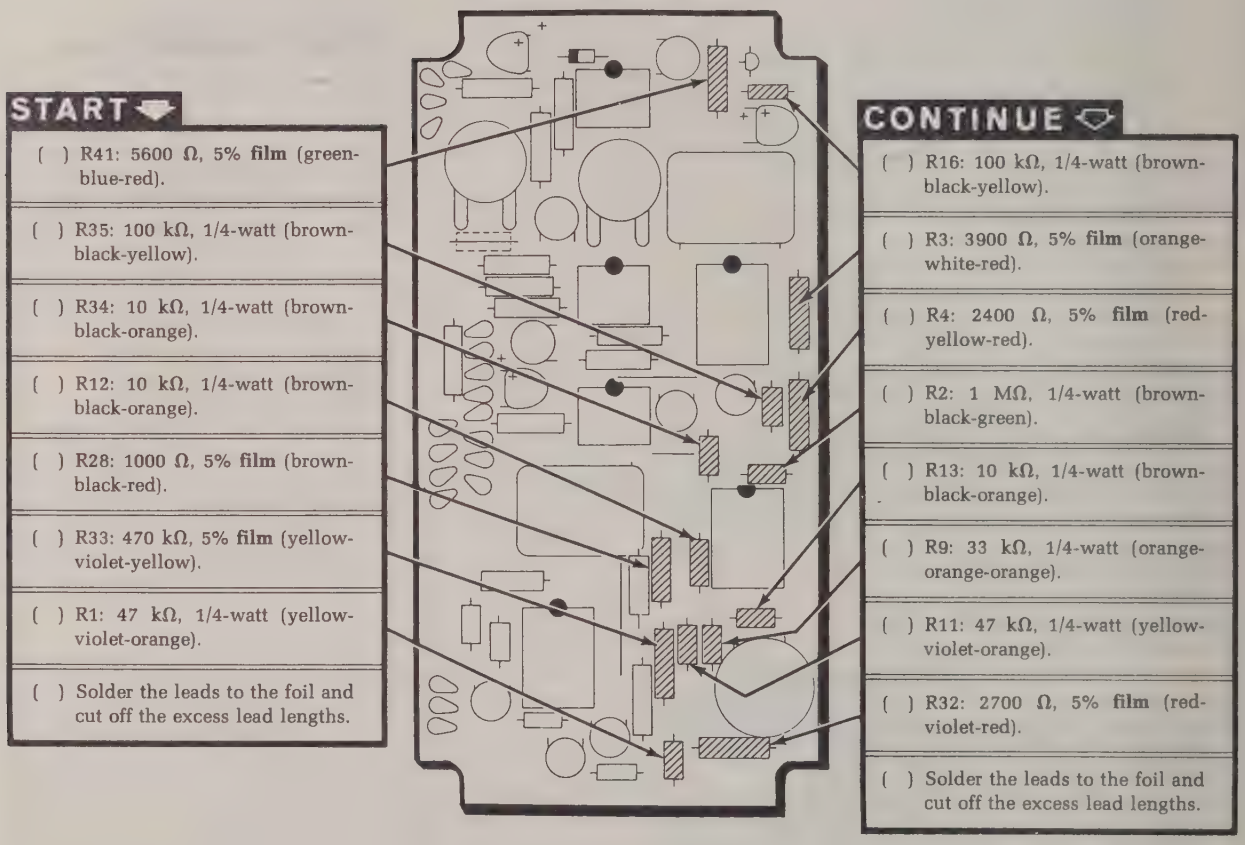
( ) R31: 1200 Ω, 5% **film** (brown-red-red).

( ) R8: 100 kΩ, 1/4-watt (brown-black-yellow).

( ) R5: 100 kΩ, 1/4-watt (brown-black-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.




START
( ) R41: 5600 Ω, 5% film (green-blue-red).
( ) R35: 100 kΩ, 1/4-watt (brown-black-yellow).
( ) R34: 10 kΩ, 1/4-watt (brown-black-orange).
( ) R12: 10 kΩ, 1/4-watt (brown-black-orange).
( ) R28: 1000 Ω, 5% film (brown-black-red).
( ) R33: 470 kΩ, 5% film (yellow-violet-yellow).
( ) R1: 47 kΩ, 1/4-watt (yellow-violet-orange).
( ) Solder the leads to the foil and cut off the excess lead lengths.
CONTINUE
( ) R16: 100 kΩ, 1/4-watt (brown-black-yellow).
( ) R3: 3900 Ω, 5% film (orange-white-red).
( ) R4: 2400 Ω, 5% film (red-yellow-red).
( ) R2: 1 MΩ, 1/4-watt (brown-black-green).
( ) R13: 10 kΩ, 1/4-watt (brown-black-orange).
( ) R9: 33 kΩ, 1/4-watt (orange-orange-orange).
( ) R11: 47 kΩ, 1/4-watt (yellow-violet-orange).
( ) R32: 2700 Ω, 5% film (red-violet-red).
( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-4

START

NOTES:

1. When you install each of the following capacitors, first bend their leads 90°. (See the illustrations below.) Insert the leads into the circuit board holes and push the capacitor down against the circuit board. Then solder the leads to the foil and cut off the excess lead lengths.

2. When you install tantalum capacitors, always match the positive (+) marked lead on the capacitor with the positive (+) mark on the circuit board.

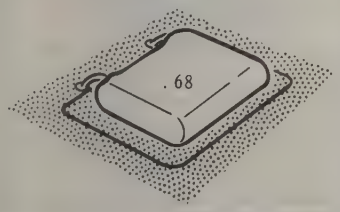
( ) C13: 33 μF tantalum.

( ) C6: .001 μF ceramic.

( ) C7: .001 μF ceramic.

( ) C16: 33 μF tantalum.

( ) C9: .68 μF Mylar.

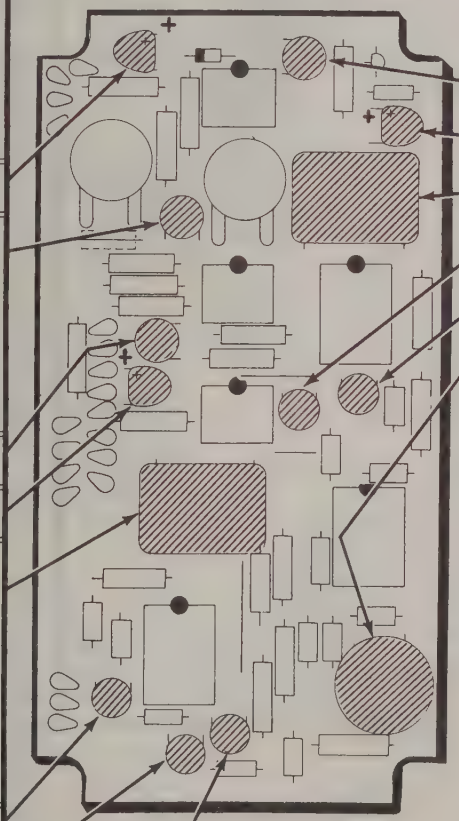


( ) C2: 100 pF (100k) ceramic.

( ) C1: 180 pF ceramic.

( ) C3: .001 μF ceramic.

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) C15: 27 pF ceramic.

( ) C14: 33 μF tantalum.

( ) C8: .68 μF Mylar.

( ) C11: 470 pF ceramic.

( ) C12: .001 μF ceramic.

( ) C5: .003 μF ceramic.

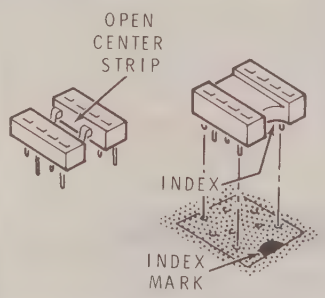
( ) Solder the leads to the foil and cut off the excess lead lengths.

NOTE: Make sure all the capacitors are against the circuit board.

PICTORIAL 1-5

START

NOTE: The IC sockets that you will install in the following steps will have either an open or solid center strip. The socket with the solid center strip will have an identification mark on one end (an arrow, a dot, or a notch). Always position this end of the socket toward the index mark on the circuit board.

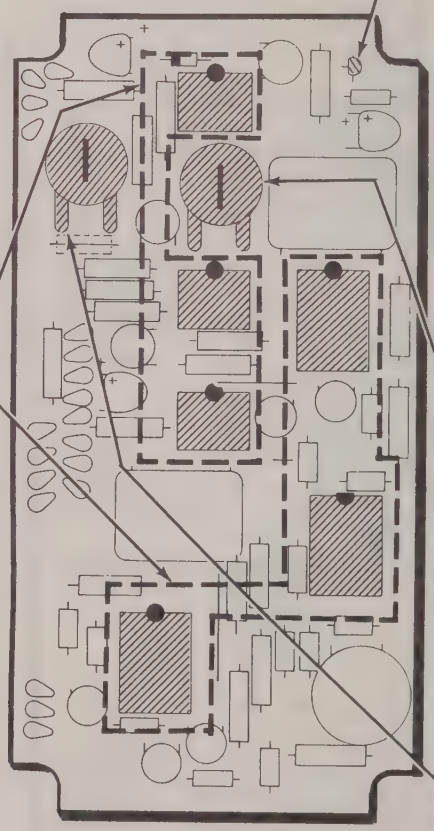


Solder the socket pins to the foil as you install them.

( ) Install three 8-pin IC sockets.

( ) Install three 14-pin IC sockets.

NOTE: DO NOT install the IC's at this time. They will be installed later.

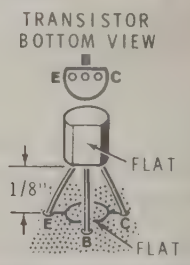


PICTORIAL 1-6

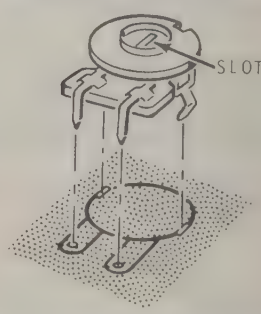
CONTINUE

( ) Q1: Install a 2N4121 transistor (#417-235) in the following manner.

1. Refer to the illustration and identify the C, B, and E leads.
2. Insert the leads into the corresponding C, B, and E holes in the circuit board.
3. Position the transistor 1/8" above the circuit board.
4. Turn the circuit board over, solder the leads to the foil, and cut off the excess lead lengths.

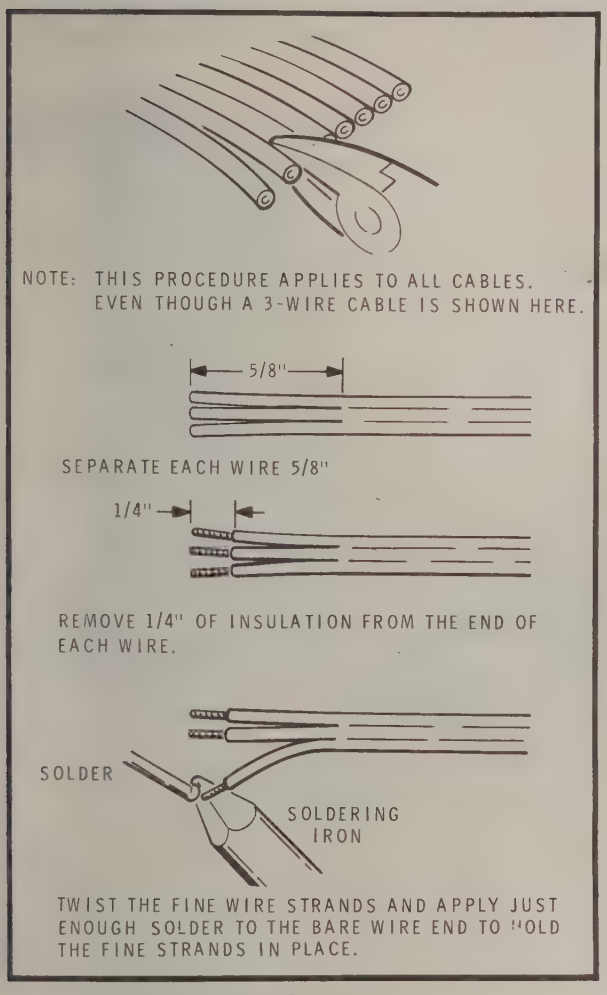


( ) R14: 100 kΩ control (#10-389). Solder all four lugs to the foil.



( ) R19: 2000 Ω control (#10-382) NOTE: Make sure you solder all 4 lugs.

( ) Set R14 and R19 to the center of their rotation. Position the slot as shown.


NOTE: THIS PROCEDURE APPLIES TO ALL CABLES. EVEN THOUGH A 3-WIRE CABLE IS SHOWN HERE.
5/8"
SEPARATE EACH WIRE 5/8"
1/4"
REMOVE 1/4" OF INSULATION FROM THE END OF EACH WIRE.
SOLDER
SOLDERING IRON
TWIST THE FINE WIRE STRANDS AND APPLY JUST ENOUGH SOLDER TO THE BARE WIRE END TO HOLD THE FINE STRANDS IN PLACE.

Detail 1-7A

Refer to Pictorial 1-7 (Illustration Booklet, Page 3).

( ) Position the A to D circuit board as shown.

NOTE: In the following steps, you will separate the multicolored 8-wire cable into 3-wire and 4-wire cable groups. Separate the cable into specific color groups called for in the step. Then prepare the ends of each cable as instructed. Use only the multicolored 8-wire cable until you are instructed otherwise.

( ) Cut two 2" lengths of multicolored 8-wire cable and separate them into the following:

Brown, red, and orange 3-wire cable.

Yellow, green, blue, and violet 4-wire cable.

Brown, red, orange, and yellow 4-wire cable.

( ) Refer to Detail 1-7A and prepare the ends of each cable as shown. Use diagonal cutters or a knife to start separating the wires.

NOTE: In the following steps, (NS) means not to solder because other wires will be added later. "S-" with a number, such as (S-2), means to solder the connection. The number following the "S" tells how many wires are at the connection. In the following steps, solder the wires to the foil as you install each wire group. Cut off the excess lead lengths from the foil side of the circuit board. The free ends of the cable groups will be connected later.

Connect one end of the brown, red, and orange 3-wire cable to the A to D circuit board as follows:

( ) Brown wire to hole A (S-1).

( ) Red wire to hole B (S-1).

( ) Orange wire to hole C (S-1).

Connect one end of the yellow, green, blue, and violet 4-wire cable to the A to D circuit board as follows:

( ) Yellow wire to hole D (S-1).

( ) Green wire to hole E (S-1).

( ) Blue wire to hole F (S-1).

( ) Violet wire to hole G (S-1).

Connect one end of the brown, red, orange, and yellow 4-wire to the A to D circuit board as follows:

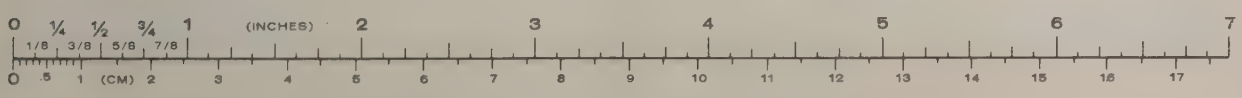
( ) Brown wire to hole H (S-1).

( ) Red wire to hole J (S-1).

( ) Orange wire to hole K (S-1).

( ) Yellow wire to hole L (S-1).

Set the circuit board aside.

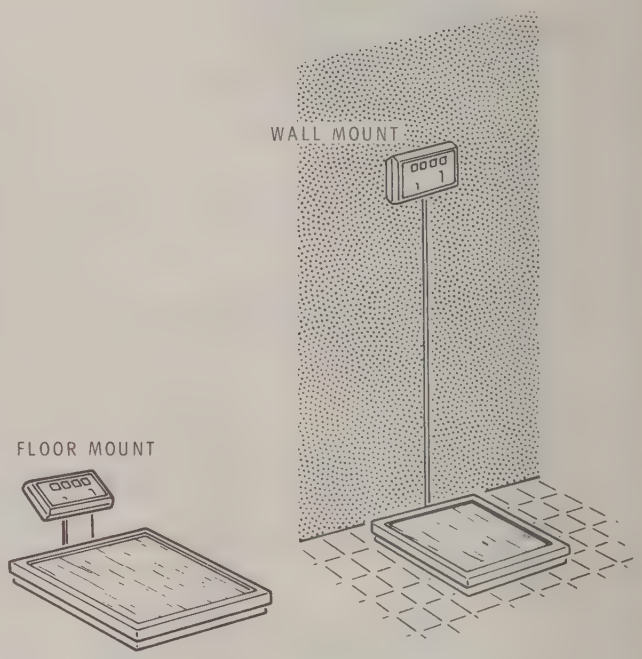


DISPLAY CABINET INSTALLATION OPTIONS

There are two types of display cabinet installations you can perform as shown in Pictorial 1-8; "Floor Mounting" and "Wall Mounting." Floor mounting requires that you mount the display cabinet on the platform assembly and wall mounting requires that you mount the display cabinet on the wall or some other suitable location. If you intend to use the floor mounting procedure, perform the following two steps. Then proceed to "Display Circuit Board." If you intend to use the wall mounting procedure, disregard the following two steps and proceed to "Wall Cable Preparation."

( ) Refer to Detail 1-8A and cut a 10-3/4" length of brown 8-wire cable. Leave either outside wire 1/4" longer at both ends. Make sure you use the same outside wire at both ends.

( ) Prepare both ends of the cable.



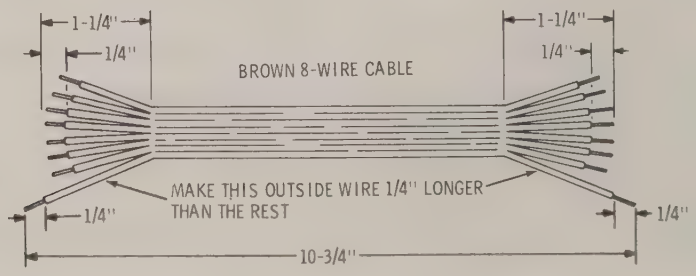
PICTORIAL 1-8

Wall Cable Preparation

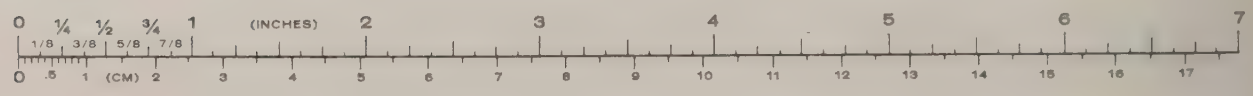
( ) Determine how long the brown 8-wire cable must be between the platform assembly and display cabinet; then add 4 extra inches and cut the cable to the predetermined length. Return the cable, platform and display cabinet to your work area.

( ) Refer to Detail 1-8A and prepare both ends of the cable as shown. Leave either outside wire 1/4" longer at both ends. Make sure you use the same outside wire at both ends.

( ) Set the cable aside.



Detail 1-8A



DISPLAY CIRCUIT BOARD

START

( ) Position the display circuit board as shown with the printed side (not the foil side) up.

( ) Prepare the following bare wires:

3/4"
2"
1-1/2"
3/4"

Connect the bare wires as follows:

( ) 3/4" bare wire.

( ) 2" bare wire.

( ) 1-1/2" bare wire.

( ) 3/4" bare wire.

( ) Solder the wires to the foil and cut off the excess lead lengths.

NOTE: To prepare a wire, as in the following step, cut the wire to the indicated length and remove 1/4" of insulation from each end.

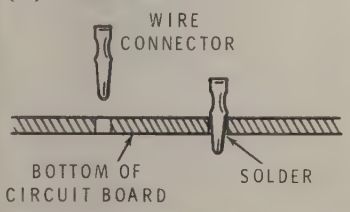
( ) Prepare a 1-1/8" red wire.

( ) 1-1/8" red wire.

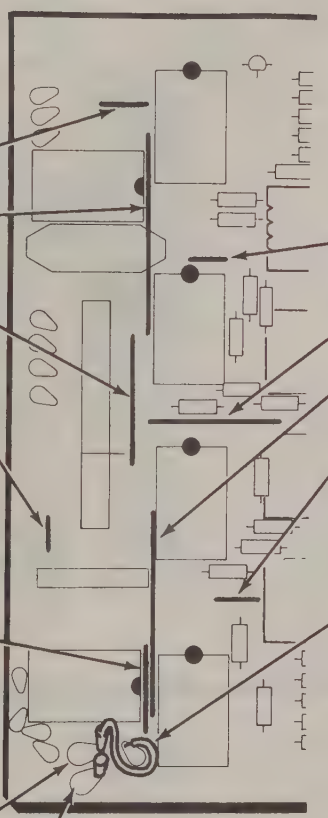
( ) Solder the wire to the foil and cut off the excess wire lengths.

In the following steps, you will install two wire connectors. Solder each wire connector as you install it.

( ) Wire connector at AA.



( ) Wire connector at AB.



PICTORIAL 2-1

CONTINUE

( ) Prepare the following bare wires:

3/4"
1-1/2"
2"
3/4"

Connect the bare wires as follows:

( ) 3/4" bare wire.

( ) 1-1/2" bare wire.

( ) 2" bare wire.

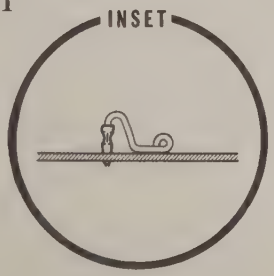
( ) 3/4" bare wire.

( ) Solder the wires to the foil and cut off the excess wire lengths.

( ) Prepare a 1-1/4" red wire.

( ) Connect one end of the 1-1/4" red wire to hole X. Solder the wire to the foil and cut off the excess wire length.

( ) Insert the free end of the 1-1/4" red wire into the wire connector at AA. **DO NOT** solder this connection. Push the wire down against the circuit board as shown in the inset drawing.



START

Install fourteen 330 Ω, 5% (orange-orange-brown) resistors.

( ) R102 .....

( ) R103 .....

( ) R115 .....

( ) R109 .....

( ) R114 .....

( ) R112 .....

( ) R113 .....

( ) R111 .....

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R121 .....

( ) R123 .....

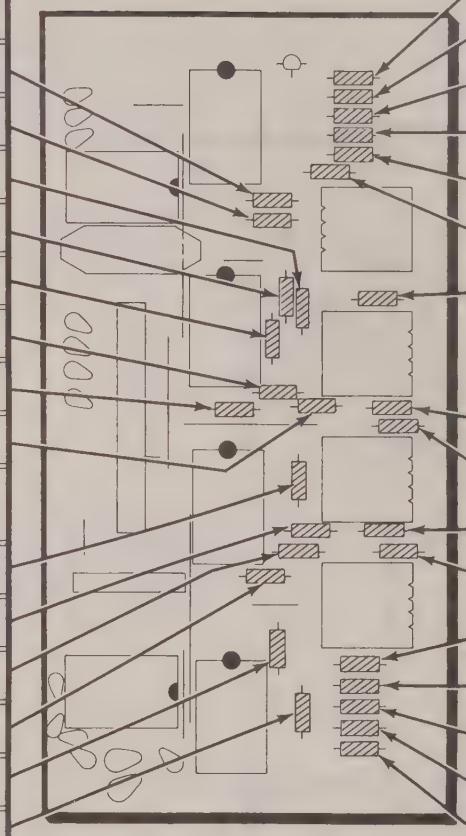
( ) R118 .....

( ) R119 .....

( ) R122 .....

( ) R129 .....

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

Install sixteen 330 Ω, 5% (orange-orange-brown) resistors.

( ) R108.

( ) R101.

( ) R105.

( ) R107.

( ) R106.

( ) R104.

( ) R116.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R125.

( ) R117.

( ) R124.

( ) R133.

( ) R126.

( ) R132.

( ) R131.

( ) R127.

( ) R128.

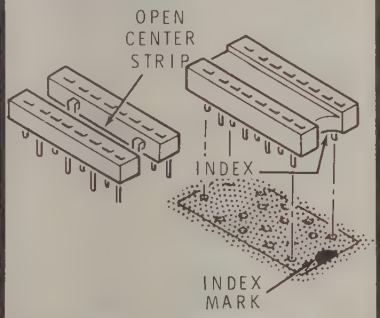
( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 2-2

START

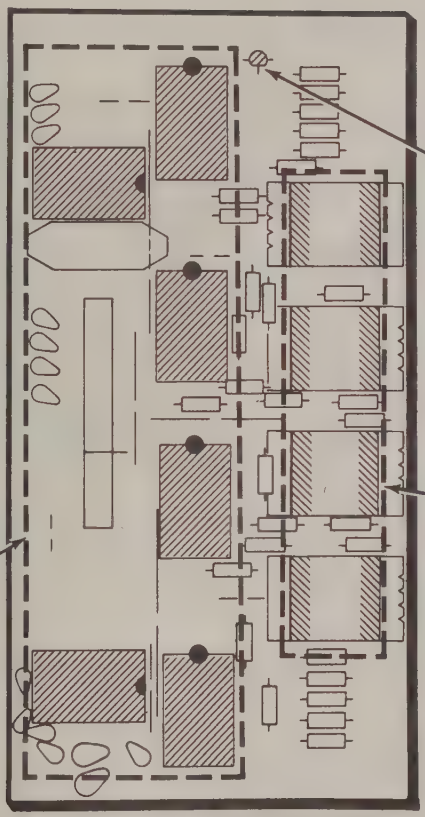
NOTE: The IC sockets that you will install in the following steps will have either an open or solid center strip. The socket with the open center strip may be installed either way. The socket with the solid center strip will have an identification mark on one end (an arrow, a dot, or a notch). Always position this end of the socket toward the index mark on the circuit board.

As you install each socket, make sure all of the pins are through the circuit board holes and that none are bent over. Then solder the pins to the foils. Make sure the socket is straight and flush with the circuit board.



Solder the socket pins to the foil as you install them.

( ) Six 16-pin IC sockets.

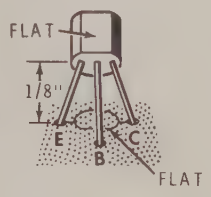


CONTINUE

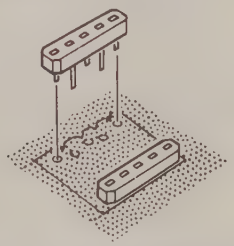
NOTE: When you install a transistor:

1. Refer to the illustration and identify the E, C, and B leads.
2. Bend the center lead as shown.
3. Insert the leads into the corresponding E, B, and C holes in the circuit board.
4. Position the transistor 1/8" above the circuit board.
5. Turn the circuit board over, solder the leads to the foil, and cut off the excess lead lengths.

( ) Q101: Install a 2N4121 transistor (#417-235).



( ) Mount eight 5-pin sockets as shown. Solder the pins as you install them. Make sure each socket is straight and is flush with the circuit board.



PICTORIAL 2-3

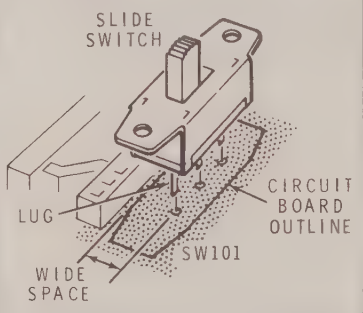
START

( ) SW101: Slide switch. Install the switch as follows:

1. Place the switch over the outline on the circuit board with the wide space as shown.

2. Insert the switch lugs into the circuit board holes.

3. Press the switch down as far as it will go onto the circuit board and solder the lugs to the foil. Make sure the switch is standing vertically.

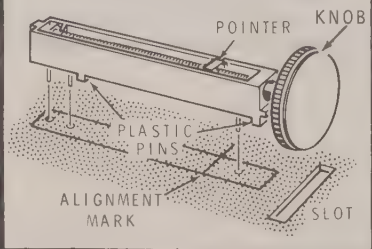


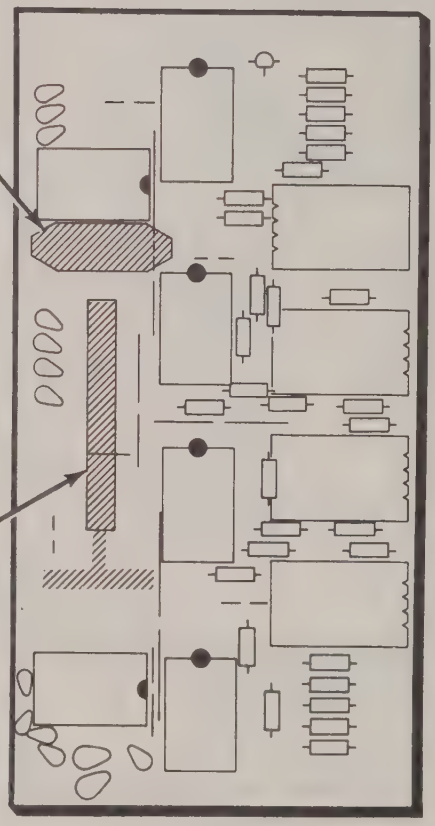
( ) R134: 10 kΩ control (#10-1083). Install the control as follows:

1. Insert the control lugs into the circuit board holes.

2. Press the control down against the circuit board outline so the plastic pins seat in the holes. Solder the lugs to the foil.

3. Turn the knob and preset the control pointer over the alignment mark on the circuit board.





PICTORIAL 2-4

CABLE INSTALLATION

Refer to Pictorial 2-5 (Illustration Booklet, Page 3) for the following steps.

( ) Position both circuit boards as shown.

NOTE: When you connect the free ends of the cables coming from the A to D circuit board to the display circuit board in the following steps, make sure you do not cross any of the wires. Solder the wires to the foil as they are connected and cut off the excess wire lengths from the foil side.

Connect the 3-wire cable as follows:

( ) Brown wire to hole A (S-1).

( ) Red wire to hole B (S-1).

( ) Orange wire to hole C (S-1).

Connect the center 4-wire cable as follows:

( ) Yellow wire to hole D (S-1).

( ) Green wire to hole E (S-1).

( ) Blue wire to hole F (S-1).

( ) Violet wire to hole G (S-1).

Connect the remaining 4-wire cable as follows:

( ) Brown wire to hole H (S-1).

( ) Red wire to hole J (S-1).

( ) Orange wire to hole K (S-1).

( ) Yellow wire to hole L (S-1).

NOTE: In the following two steps, you will connect only one end of the brown 8-wire cable to the A to D circuit board. The other end will be connected later. Solder each wire as it is connected. Make sure you do not cross any of the wires.

( ) Connect either end of the long wire to hole N (S-1).

( ) Connect the remaining cable wires to holes S through Y as shown. Make sure you do not cross any of the wires as you connect them.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit boards for the following conditions.

( ) Unsoldered connections.

( ) Poor solder connections.

( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

( ) Tantalum capacitors for the correct position of the positive (+) end.

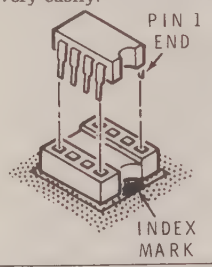
( ) Diode for the correct position of the banded end.

IC-LED INSTALLATION

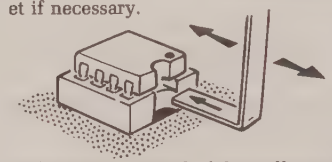
START

( ) Position the A to D circuit board as shown. In the following steps, you will install IC's in the designated sockets. Be careful to match the pin 1 end of each IC to the index mark on the circuit board. See Detail 2-6A (below).

Before you apply downward pressure to an IC, make sure each pin is centered in its proper socket aperture. Handle IC's with care, as their pins bend very easily.



NOTE: An IC puller has been furnished to remove an IC from its socket if necessary.

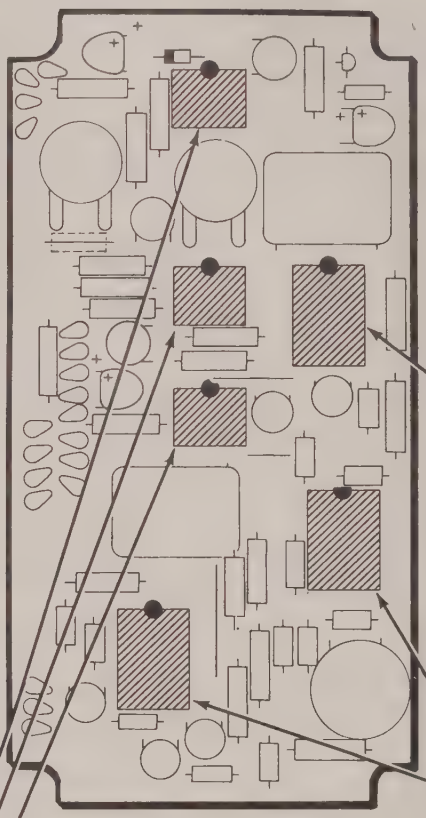


Push the shorter end of the puller in between the IC and the socket and rock the longer portion back and forth. Be very careful, as the IC pins bend very easily.

( ) IC6: LM**308**N IC (#442-66).

( ) IC3: LM**308A**N IC (#442-639).

( ) IC5: LM**308**N IC (#442-66).



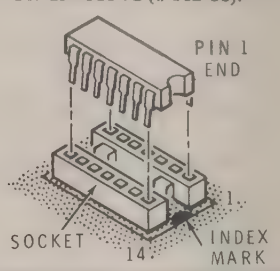
PICTORIAL 2-6

CONTINUE

CAUTION: The following integrated circuits are MOS devices that can be damaged by static electricity. Use the following sequence when you install them.

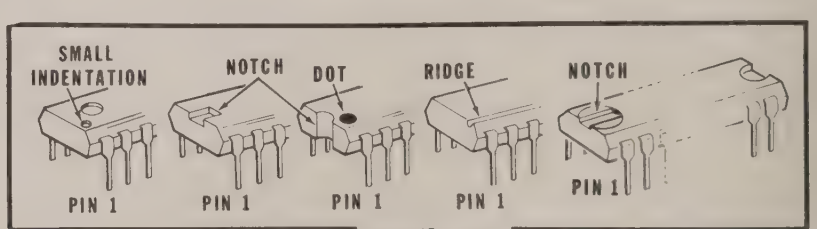
1. Remove the IC, mounted in conductive foam, from its envelope.
2. Hold the IC in one hand and pull the conductive foam pad from the pins.
3. Pick up the circuit board while you hold the IC.
4. Carefully insert the IC in its socket before you set the circuit board down onto your work surface. The IC is now protected by the socket and foil.

( ) IC4: CD**4016** IC (#442-99).



( ) IC1: LM**3302**N, or LM**2901**N, or UA**775** (#442-616).

( ) IC2: CD**4013**AE (#443-607).



Detail 2-6A

START

( ) Position the display circuit board as shown.

CAUTION: The next four integrated circuits are MOS devices that can be damaged by static electricity. Use the following sequence when you install IC101, IC102, IC103, and IC104.

1. Remove the IC, mounted in conductive foam, from its envelope.
2. Hold the IC in one hand and pull the conductive foam pad from the pins.
3. Pick up the circuit board while you hold the IC.
4. Carefully insert the IC in its socket before you set the circuit board down onto your work surface. The IC is now protected by the socket and foil.

( ) IC105: MC14518 IC (#443-737).

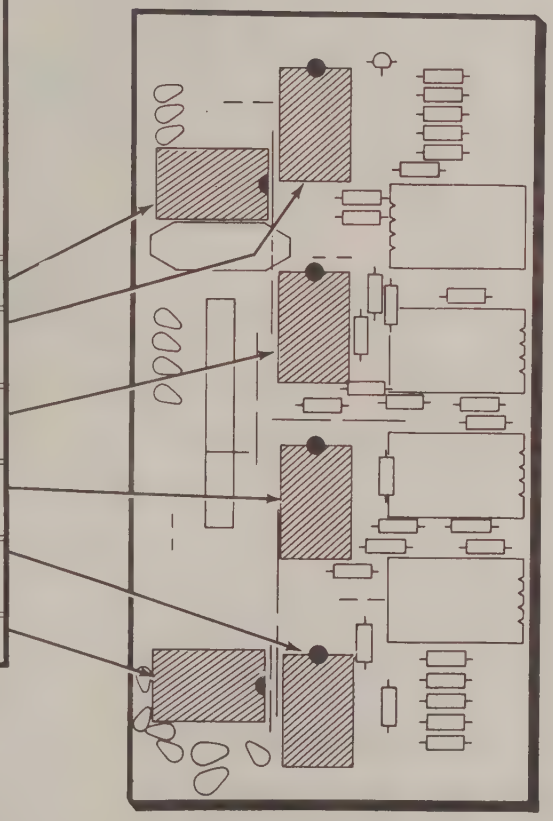
( ) IC101: MM14511 IC (#443-699).

( ) IC102: MM14511 IC (#443-699).

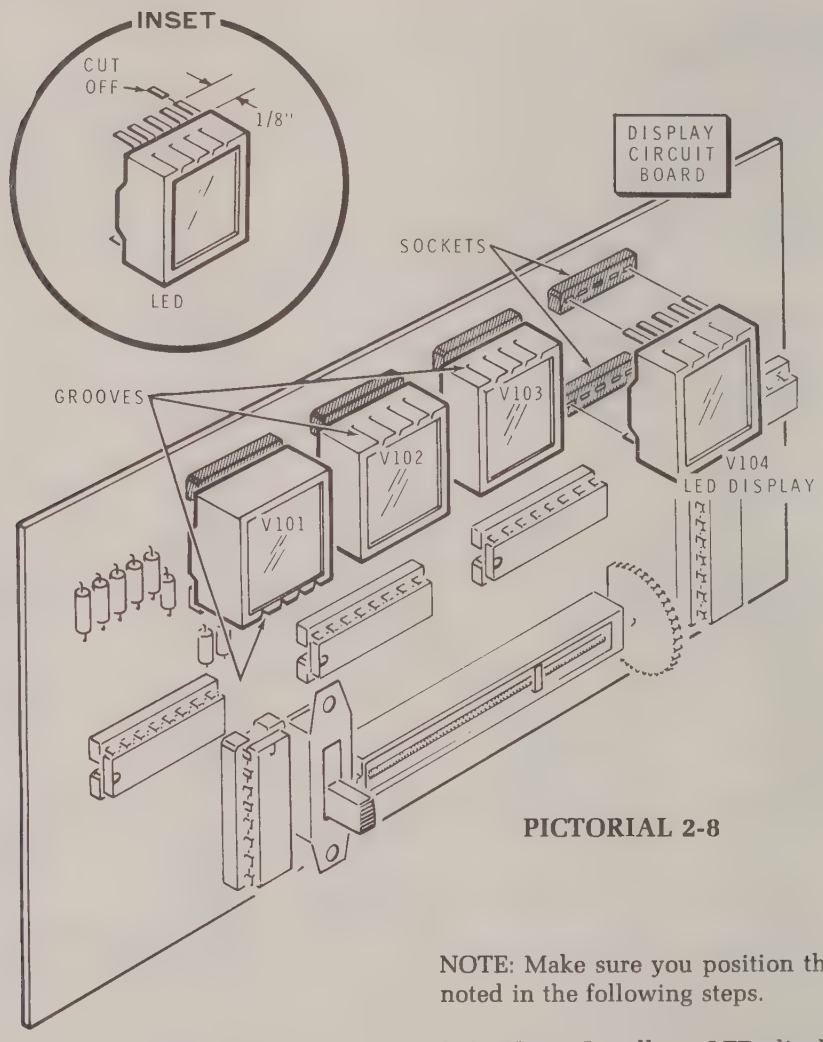
( ) IC103: MM14511 IC (#443-699).

( ) IC104: MM14511 IC (#443-699).

( ) IC106: MC14518 IC (#443-737).



PICTORIAL 2-7



PICTORIAL 2-8

Refer to Pictorial 2-8 for the following steps.

( ) Position the display circuit board as shown.

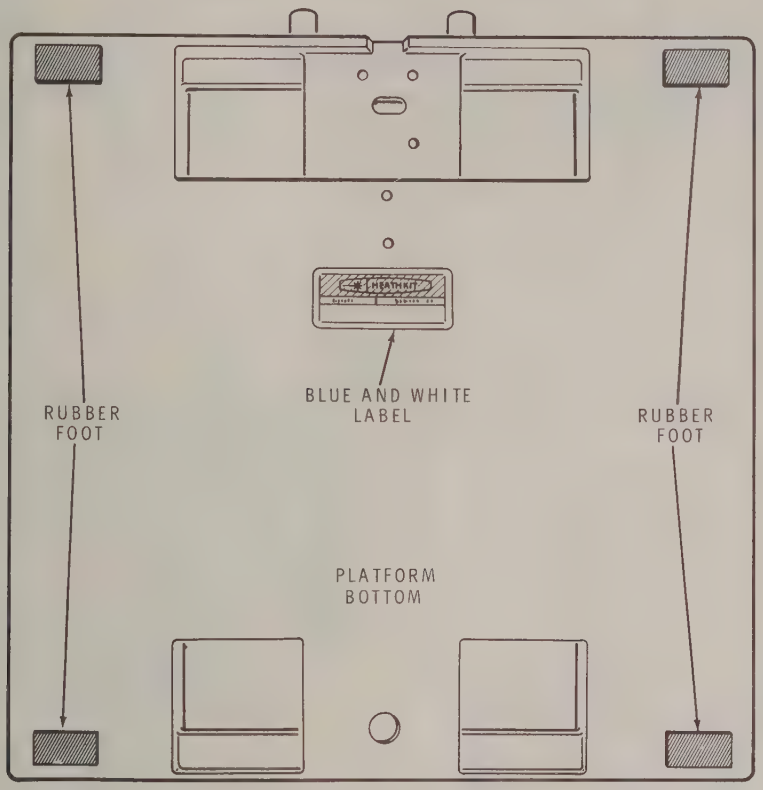
( ) Cut each LED pin to 1/8", as shown in the inset drawing.

NOTE: Make sure you position the LED grooves as noted in the following steps.

( ) V101: Install an LED display (#411-819) at V101. Position the grooves **down**. Make sure each pin is straight and that each pin goes into a socket hole.

( ) V102 through V104: Install the three remaining LED displays in the remaining sockets. Position the grooved side **up**.

Set the circuit boards aside.



PICTORIAL 3-1

PLATFORM ASSEMBLY

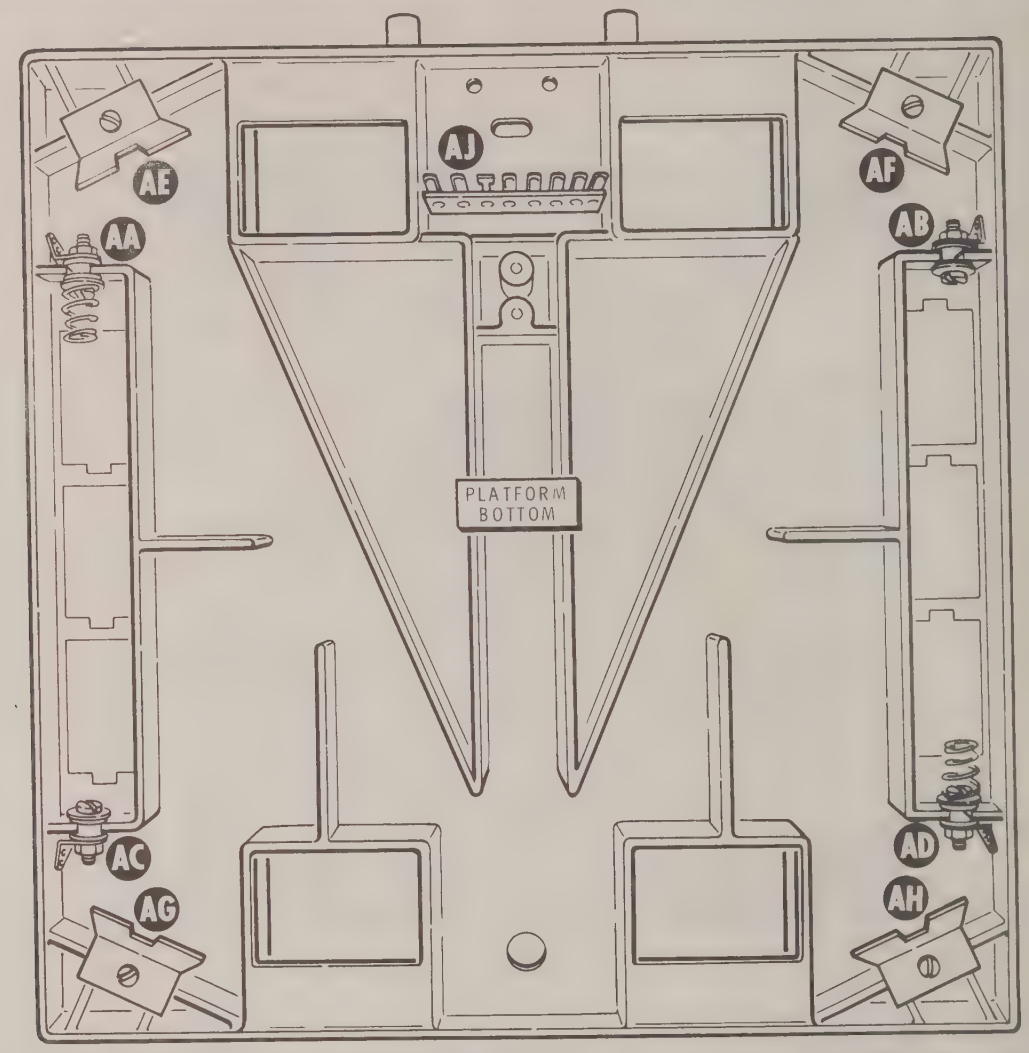
Refer to Pictorial 3-1 for the following steps.

( ) Position the platform bottom as shown.

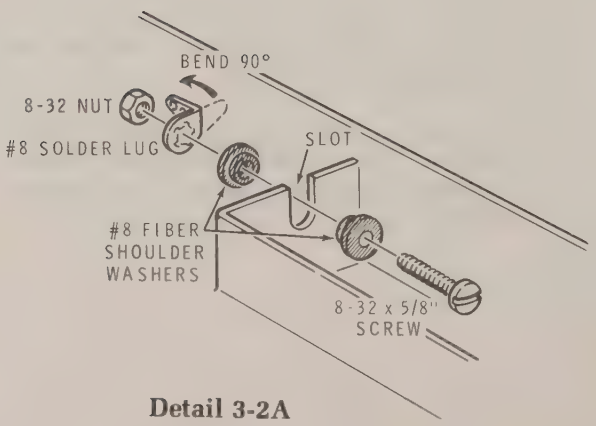
( ) Mount four rubber feet at the indicated locations. Remove the paper backing from each foot and press the foot onto the platform bottom.

NOTE: The blue and white label in the next step shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

( ) Carefully peel the protective paper backing from the blue and white label and press the label onto the platform bottom at the indicated location.



PICTORIAL 3-2



Detail 3-2A

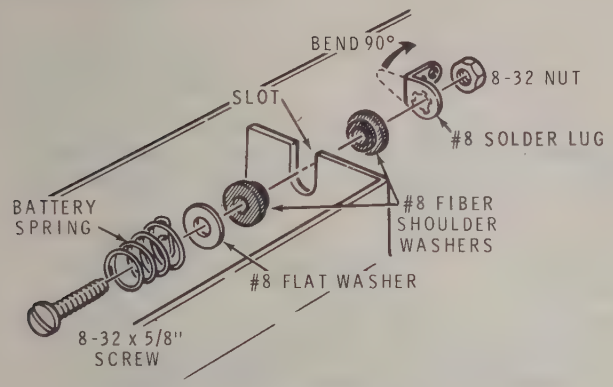
Refer to Pictorial 3-2 for the following steps.

(.) Reposition the platform bottom as shown.

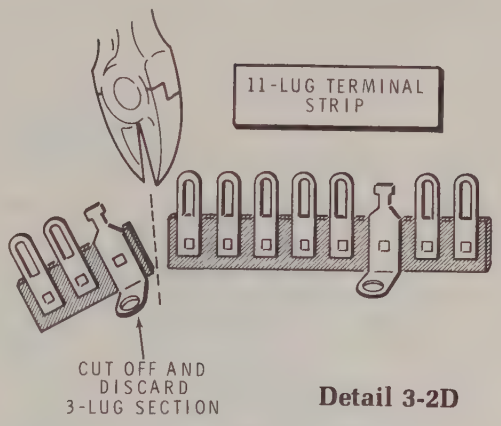
Refer to Detail 3-2A for the following three steps.

( ) Install battery posts at AB and AC with an 8-32 × 5/8″ screw, two #8 fiber shoulder washers, a #8 solder lug, and an 8-32 nut at each location. Position the solder lugs as shown and seat the shoulder washers in the slots properly. Use the wrench supplied with your kit to tighten the nuts. Do not overtighten the nuts.

( ) Bend the solder lugs 90° as shown.



Detail 3-2B



Detail 3-2D

( ) Refer to Detail 3-2B and install battery posts at AA and AD. Use an 8-32 × 5/8" screw, a battery spring, a #8 flatwasher, two #8 fiber shoulder washers, a #8 solder lug, and an 8-32 nut at each location. Bend the solder lugs 90° and position them as shown.

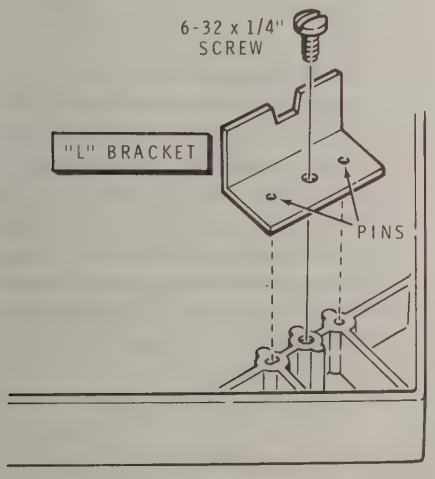
( ) Refer to Detail 3-2C and install "L" brackets at AE, AF, AG, and AH. Make sure the pins seat properly in the mounting holes. Use a 6-32 × 1/4" screw for each bracket.

( ) Refer to Detail 3-2D and prepare the 11-lug terminal strip. Discard the 3-lug section.

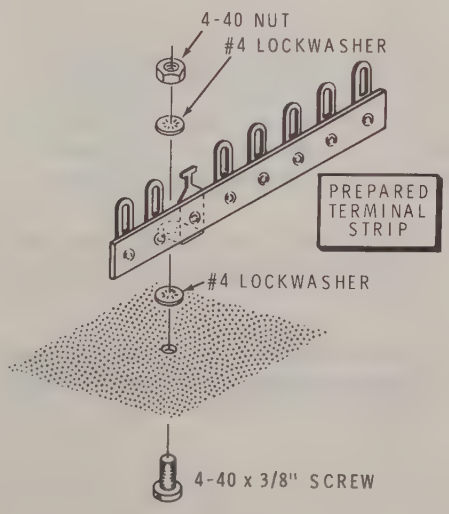
NOTE: Use the plastic nut starter to hold and start 4-40 and 6-32 nuts on screws.

( ) Refer to Detail 3-2E and mount the prepared terminal strip at AJ with a 4-40 × 3/8" screw, two #4 lockwashers, and a 4-40 nut. Position the terminal strip as shown in the Pictorial.

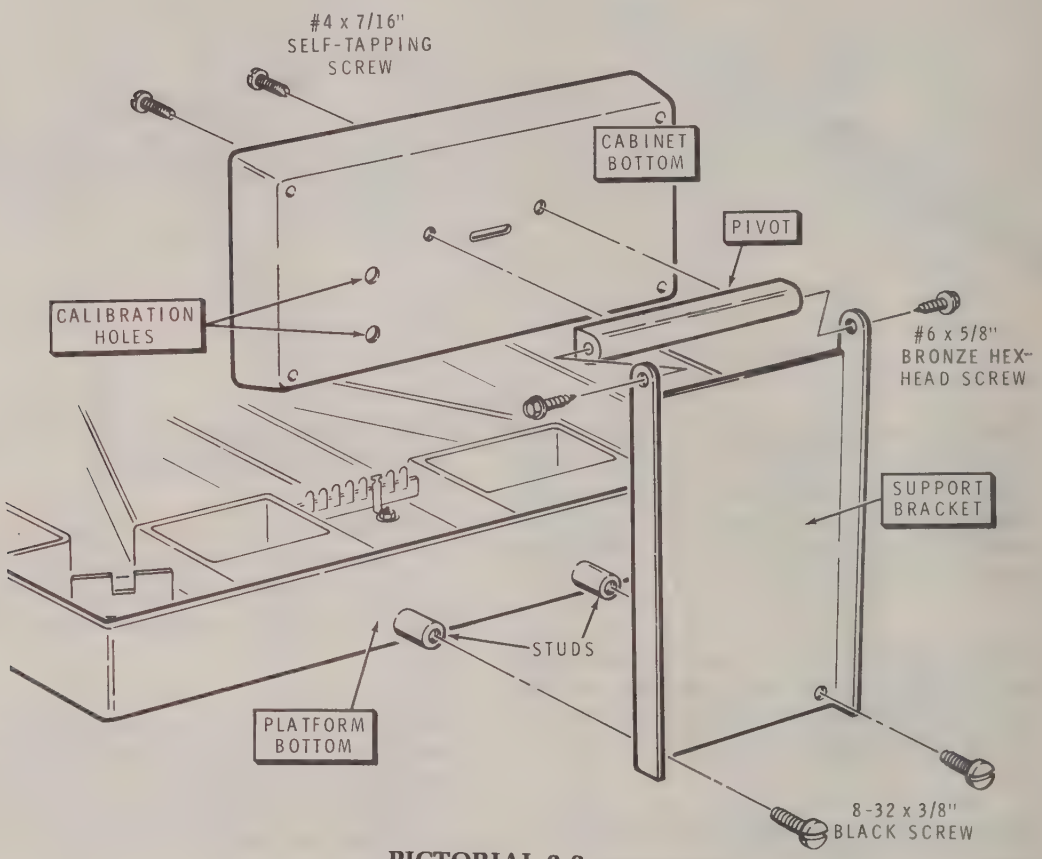
NOTE: If you intend to mount the display cabinet on the platform assembly, complete the following three steps; then proceed to "Circuit Board Installation." If you intend to mount the display cabinet on the wall or some other suitable location, disregard the following three steps and proceed to "Circuit Board Installation."



Detail 3-2C



Detail 3-2E



PICTORIAL 3-3

Refer to Pictorial 3-3 for the following steps.

1. ( ) Mount the support bracket to the platform bottom studs with two 8-32 × 3/8" black screws.

2. ( ) Mount the pivot to the display cabinet bottom with two #4 × 7/16" self-tapping screws.

3. ( ) Position the display cabinet bottom with the Zero and Gain calibration holes as shown and mount the display cabinet bottom to the support bracket with two #6 × 5/8" bronze hex-head screws. Do not overtighten the screws. The display cabinet bottom should pivot easily and smoothly.

CIRCUIT BOARD INSTALLATION

Refer to Pictorial 3-4 (Illustration Booklet, Page 4) for the following steps.

NOTE: When you position the platform bottom for the following steps, you may find it easier if you place a book under the display cabinet bottom.

( ) Position the two circuit boards back-to-back (foil sides facing each other).

( ) Install the insulating paper between the two circuit boards so the slot is positioned under the Zero knob. DO NOT remove the backing paper from the insulating paper.

( ) Route the brown 8-wire cable around the pivot and down the mounting bracket as shown.

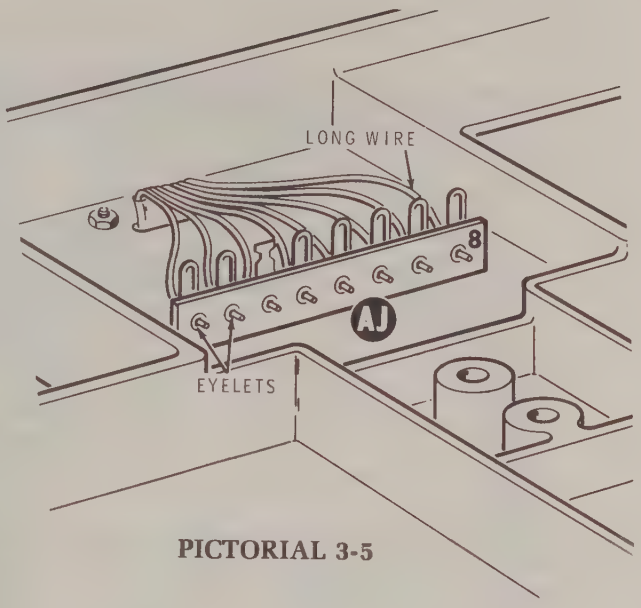
( ) Position the A to D circuit board so the two controls are over the calibration holes in the display cabinet bottom. Then install the circuit boards and insulating paper in the display cabinet bottom and temporarily slide four #4 × 1-1/8" screws in the four holes in the display cabinet.

( ) Cut a 1-3/4" length of large sleeving and slide it over the end of the brown 8-wire cable.

( ) Route 1-3/4" of the brown 8-wire cable through slot BE in the display cabinet bottom.

( ) Position the sleeving so that 1-1/2" of the sleeving is below slot BE. Then slide the end of the remaining sleeving up through slot BE.

( ) Install the cable retainer at AK with two 6-32 × 5/8" screws, two #6 lockwashers, and two 6-32 nuts. Tighten the screws just enough to prevent the cable from slipping.

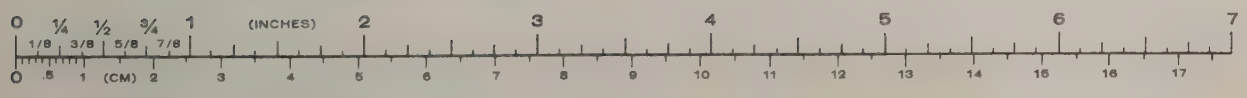


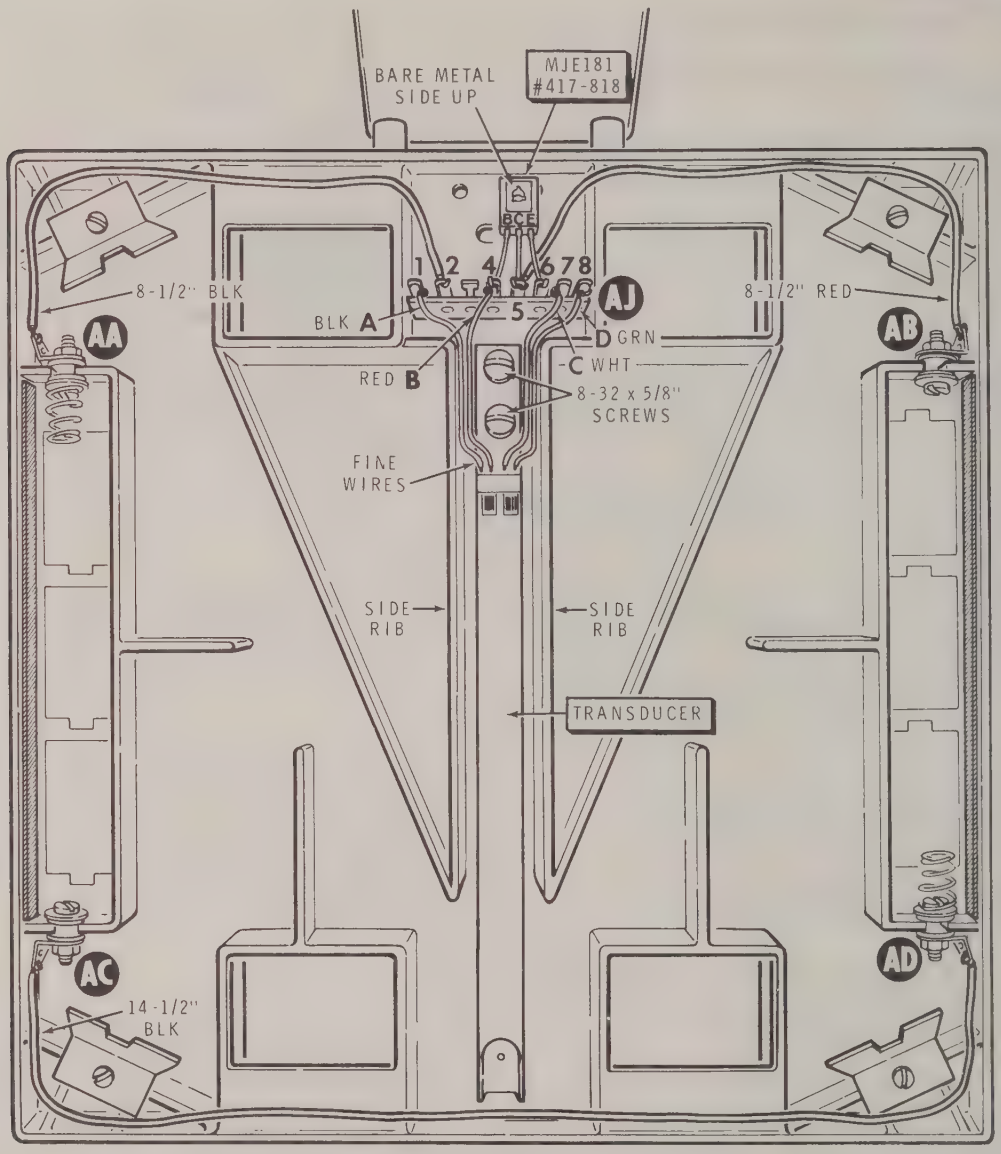
PICTORIAL 3-5

Refer to Pictorial 3-5 for the following steps.

NOTE: Any connections to the bottom eyelet of a terminal strip lug are independent of the connections to the upper hole in that lug. Each will have its own solder instructions.

( ) Connect the eight wires from the brown 8-wire cable to the bottom eyelets of terminal strip AJ. The long wire should be at eyelet 8. Solder the connections as they are made and cut off the excess wire lenghts. Do not cross any of the wires as you connect them.





PICTORIAL 3-6

Refer to Pictorial 3-6 for the following steps.

( ) Prepare the following wires:

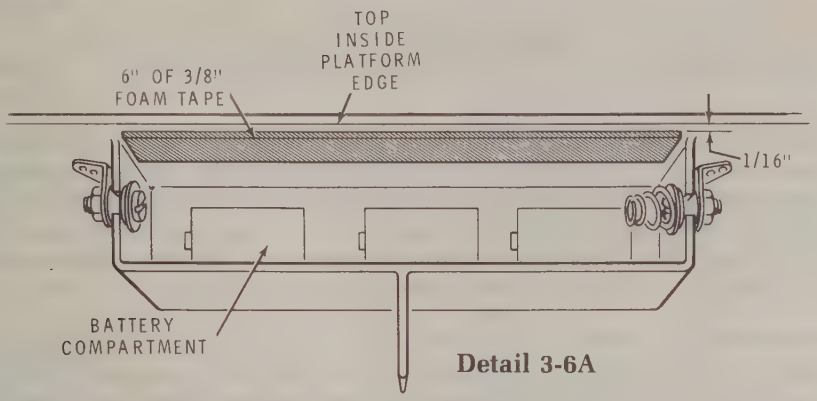
8-1/2" black

14-1/2" black

8-1/2" red

NOTE: The remaining connections will all be to the upper hole in the terminal strip lugs.

( ) Connect one end of an 8-1/2" black wire to solder lug AA (S-1) and the other end to terminal strip AJ lug 2 (S-1). NOTE: Apply only a small amount of solder to this connection, since another wire will be added later. The wire is soldered at this time to assure a positive connection during the calibration.



Detail 3-6A

( ) Connect one end of a 14-1/2" black wire to solder lug AC (S-1) and the other end to solder lug AD (S-1).

( ) Connect one end of an 8-1/2" red wire to solder lug AB (S-1) and the other end to terminal strip AJ lug 5 (NS).

CAUTION: Do not pull on the wires coming from the transducer or damage may occur. Also, be careful not to damage the fine wires wrapped around the transducer when you mount it in the following step.

( ) Mount the transducer on the platform bottom with two 8-32 × 5/8" screws. Keep the transducer parallel with the side ribs in the platform bottom.

Connect the wires coming from the transducer to terminal strip AJ as follows:

( ) Black wire A to lug 1 (S-1).

( ) Red wire B to lug 4 (NS).

( ) White wire C to lug 7 (S-1).

( ) Green wire D to lug 8 (S-1).

( ) Q201: Position the MJE181 transistor (#417-818) with the bare metal side up as shown. Then connect the leads as follows:

Lead B to lug 4 (S-2).

Lead C to lug 5 (S-2).

Lead E to lug 6 (S-1).

( ) Position the battery post wires so they are below the top edge of the platform bottom.

( ) Cut two 6" lengths of 3/8" foam tape.

( ) Refer to Detail 3-6A and remove the paper backing from a 6" length of 3/8" foam tape. Install the tape 1/16" below the top inside edge of the platform bottom at both battery compartments as shown.

Set the platform bottom aside.

Refer to Pictorial 3-7 (Illustration Booklet, Page 4) for the following steps.

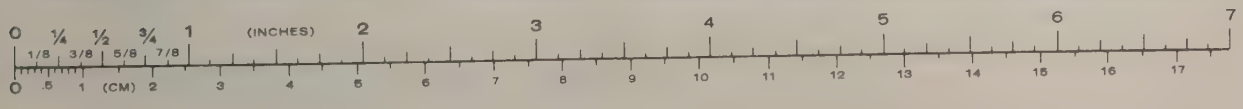
( ) Position the platform top as shown.

( ) Position the clamp as shown and install a 6-32 × 5/8" screw, a 6-32 nut, and a #6 lockwasher on the clamp. Tighten the nut finger tight.

( ) Mount the clamp at post AL on the platform top. Turn the clamp until the nut contacts the post.

( ) Use the wrench supplied with your kit and turn the nut approximately 1/4 turn as shown in the inset drawing. Rotate the clamp and make sure it turns smoothly without being loose.

Set the platform top aside. This completes the "Step-by-Step Assembly." Proceed to "Initial Tests and Adjustments."



INITIAL TESTS AND ADJUSTMENTS

The following procedures will calibrate your Digital Scale and insure that it is operating properly. If you do not get the proper results when you perform a calibration step, refer to the "Condition and Possible Cause" chart which follows the step and check the items listed there to find the problem. If you cannot find the problem there, refer to "In Case of Difficulty" on Page 43. Make sure you correct any problems before you proceed to any other tests.

Several of the "Conditions" in the charts include IC's as the "Possible Cause." Before you assume that an IC is defective, check the soldering around the socket pins, or the IC itself for bent pins not going into the socket holes. Also, check the circuitry associated with that IC and make sure no components are interchanged (resistors or capacitors). If possible, use an oscilloscope to check the waveforms shown on the Schematic. This can pinpoint a problem and make replacement of good IC's unnecessary.

INITIAL TESTS

Refer to Pictorial 3-8 (Illustration Booklet, Page 5) for the following steps.

( ) Position the platform bottom as shown.

( ) Place the AUTO/MANUAL switch (SW101) to the down position.

( ) Install the "C" cell batteries in the left and right battery compartments. The battery outlines are etched at the bottom of each battery compartment. Make sure you observe the proper polarities. There should be no display at this time.

CONDITION	POSSIBLE CAUSE
Display lights with SW101 in down position.	1. Wiring at terminal strip AJ. 2. Battery post screws or solder lugs shorting against platform bottom. 3. SW101.

( ) Place the AUTO/MANUAL switch (SW101) to the up position. Allow four to five seconds for the reading to stabilize. All four LED displays should indicate a number. The decimal point should be lit and the low battery indicator should be off.

CONDITION	POSSIBLE CAUSE
No numbers displayed; no light.	1. Battery or batteries are defective or installed incorrectly. 2. Terminal strip AJ wired incorrectly. 3. IC6, Q1, Q201, and associated circuits. NOTE: If you suspect an IC, interchange it with a known good IC of the same type.

CONDITION	POSSIBLE CAUSE
One segment of a digit is not lit.	1. LED display pin bent. 2. Associated sockets or IC. (V101-IC101, V102-IC102, V103-IC103, V104-IC104.) See above note.
One or more of the four digits does not light.	1. LED display or associated IC. 2. No latch enable pulse. Check IC2 and associated circuits. 3. No reset pulse. Check IC4 and associated circuits.
Decimal point does not light.	1. LED display (interchange displays). 2. R122.
Low battery indicator light is on.	1. Battery or batteries weak. 2. Battery installation incorrect. 3. Q101, IC1D, and associated circuits. 4. R29, R31, R32.
Reading varies more than one count after being on more than 5 seconds.	1. Batteries (if LO BAT is on). 2. C8, C9, C12, R14, R134, and ZD1.

( ) Depress the end of the transducer with your finger. The display should change. The readings should change once each second and should increase as you increase pressure.

CONDITION	POSSIBLE CAUSE
Reading decreases when transducer is depressed.	1. Transducer and wiring to terminal strip AJ.
No change when transducer is depressed.	1. IC3, transducer, or wiring from transducer.

( ) Refer to the inset drawing and adjust the course ZERO control for a display close to zero (999.0 to 001.0). The last digit may vary ±1 count.

( ) Place the AUTO/MANUAL switch (SW101) to the down position.

Low Battery Test

Refer to Detail 3-8A (Illustration Booklet, Page 5) for the following three steps.

( ) Remove two batteries from the left battery compartment and push the remaining battery against the positive battery post.

( ) Place the AUTO/MANUAL switch to the up position.

( ) Use a screwdriver or a piece of wire and short the negative end of the battery to the platform bottom. The low battery indicator should light as shown in the inset drawing. NOTE: The displayed number may be different than the one displayed with the six batteries installed.

CONDITION	POSSIBLE CAUSE
The low battery indicator does not light.	1. Q101, IC1D, and associated circuits. 2. R29, R30, R32.

( ) Reinstall the two batteries in the left battery compartment as before.

( ) Place the AUTO/MANUAL switch (SW101) to the down position.

This completes the "Initial Tests." Proceed to "Adjustments."

ADJUSTMENTS

Refer to Pictorial 3-9 (Illustration Booklet, Page 6) for the following steps.

( ) Locate the cord and tie a knot in either end.

( ) Insert the free end of the cord through the hole in the end of the transducer. Route the cord down through the hole in the platform bottom.

( ) Tie a 1″ loop in the free end of the cord.

( ) Locate the platform top.

NOTE: Look at the number stamped on the underside of the platform top within the dotted line area. Use this number to calibrate your scale in **pounds**. If you intend to calibrate your scale in **kilograms**, multiply the number stamped on the platform top by **.4536**.

( ) Position the platform bottom so it extends approximately 3″ over the edge of your work area.

( ) Place the AUTO/MANUAL switch to the up position.

( ) Adjust the front ZERO control for 000.0 ±1 count.

( ) Hang the platform top from the loop in the cord as shown.

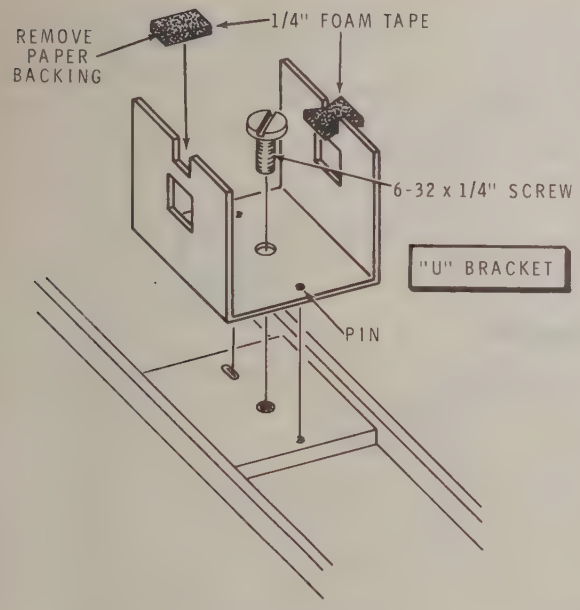
( ) Adjust the Gain control so the display reads the same as the number stamped on the platform top, or the number calculated for kilograms.

CONDITION	POSSIBLE CAUSE
Unable to calibrate for correct number.	1. R17, R19 incorrect. 2. R21 and jumper wire interchanged.

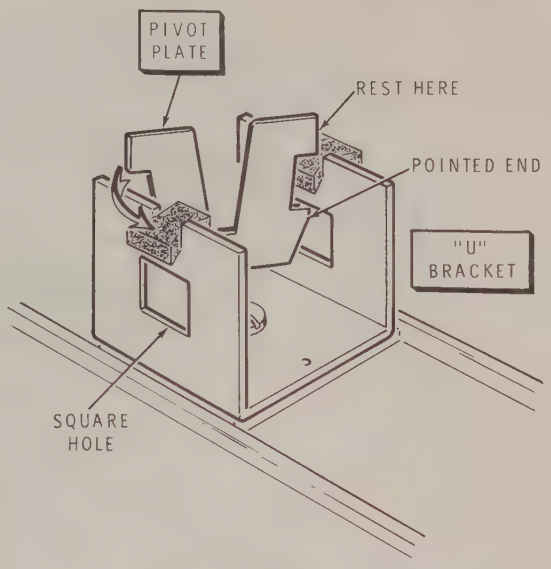
( ) Lift the platform top so the cord is slack. The displays should each read zero, ±1 count. If it does not read zero, turn the front ZERO knob for a zero reading and repeat these two steps until the readings agree.

( ) Place the AUTO/MANUAL switch to the down position.

( ) Remove the platform top from the cord.



Detail 3-10A



Detail 3-10B

Refer to Pictorial 3-10 (Illustration Booklet, Page 6) for the following steps.

( ) Position the platform top as shown.

( ) Install 6-32 × 5/8" screws and 6-32 nuts on the three remaining clamps as before. Make sure you position the clamps correctly.

( ) Install the clamps on the platform top at AM, AN, and AP in the same manner as before.

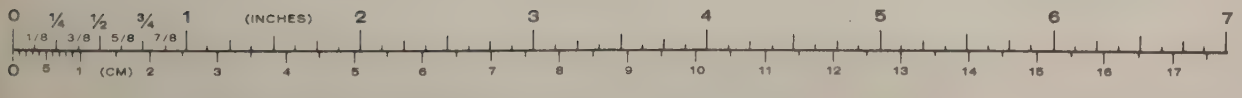
( ) Position the four clamps on the platform top as shown.

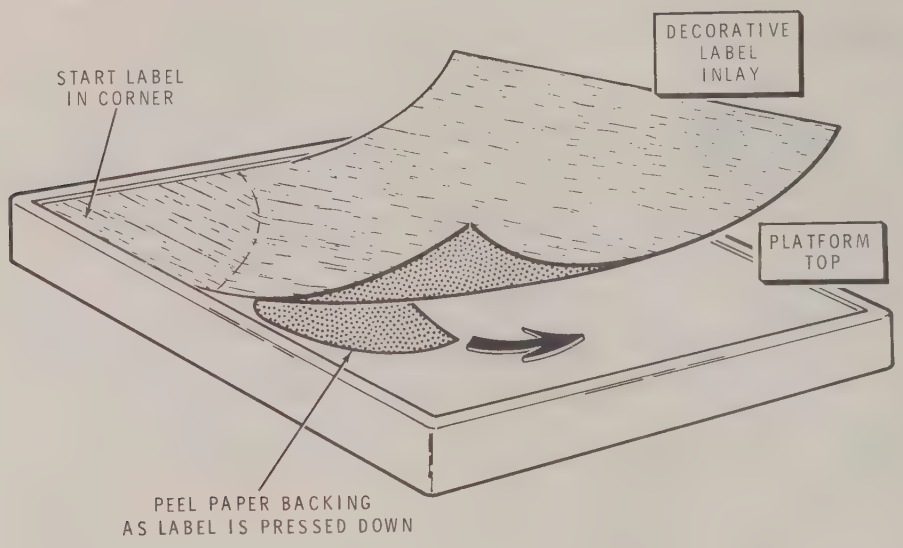
( ) Refer to Detail 3-10A and mount "U" brackets at BA, BB, BC, and BD with 6-32 × 1/4" screws. Make sure the two pins seat in the holes properly.

( ) Cut eight 1/4" lengths of 1/4" foam tape.

( ) Refer to Detail 3-10A and remove the paper backing from the foam tape. Install the foam tape on the "U" brackets as shown.

( ) Refer to Detail 3-10B and install the four pivot plates on the four "U" brackets as shown. Make sure each pivot plate rests on the foam tape.





Detail 3-11A

Refer to Pictorial 3-11 (Illustration Booklet, Page 7) for the following steps.

( ) Position the platform bottom as shown.

( ) Position the four clamps on the platform top over the four large square openings in the platform bottom temporarily install the platform top.

( ) Use a brush and remove any dust or dirt from the platform top.

NOTE: To assure proper positioning of the decorative label inlay in the following step, place the inlay on the platform top and center it evenly at all four sides. Note the spacing, then perform the following step.

( ) Refer to Detail 3-11A and peel the paper backing approximately 8″ from one corner of the decorative label inlay. Then, starting at one corner, press the inlay onto the platform top and smooth the adhered portion of the inlay out to prevent air from being trapped underneath. Also, make sure you observe the previously noted spacing.

( ) Remove the platform top and set it aside.

( ) Position the platform bottom so it extends approximately 3″ over the edge of your work area.

( ) Place the AUTO/MANUAL switch to the up position.

( ) Adjust the fron ZERO control for 000.0 ±1 count.

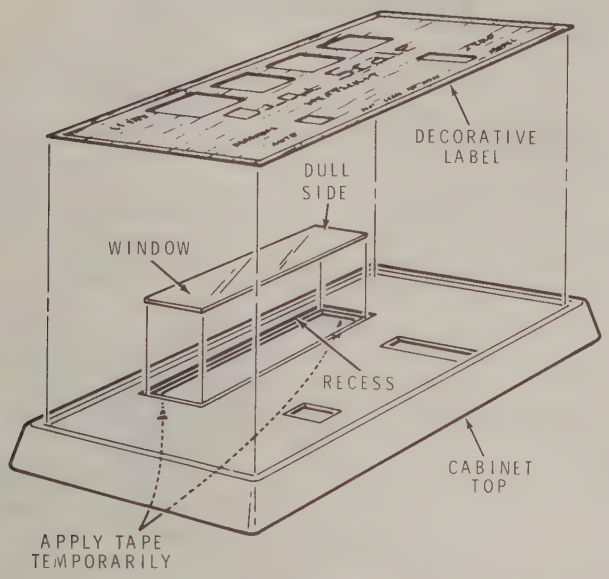
( ) Hang the platform top from the loop in the cord as shown.

( ) Record the displayed number* on the platform top next to the existing number.

( ) Place the AUTO/MANUAL switch to the down position.

( ) Remove the platform top from the cord and untie the cord from the transducer.

* Use this number if recalibration is necessary at a later time.



Detail 3-11B

( ) Remove the protective plastic coating from both sides of the window. Face the dull side of the window up.

( ) Refer to Detail 3-11B and install the window in the recess of the display cabinet top with the dull side facing up.

NOTE: You may find it easier to install the decorative label in the next step if you put small pieces of tape under the cabinet top, at opposite corners of the window. This will hold the window in place.

( ) Completely remove the paper backing from the decorative label. Carefully center the cutouts in the label over the raised cutouts in the display cabinet top. Then press the label onto the cabinet top. Remove the two pieces of tape installed previously.

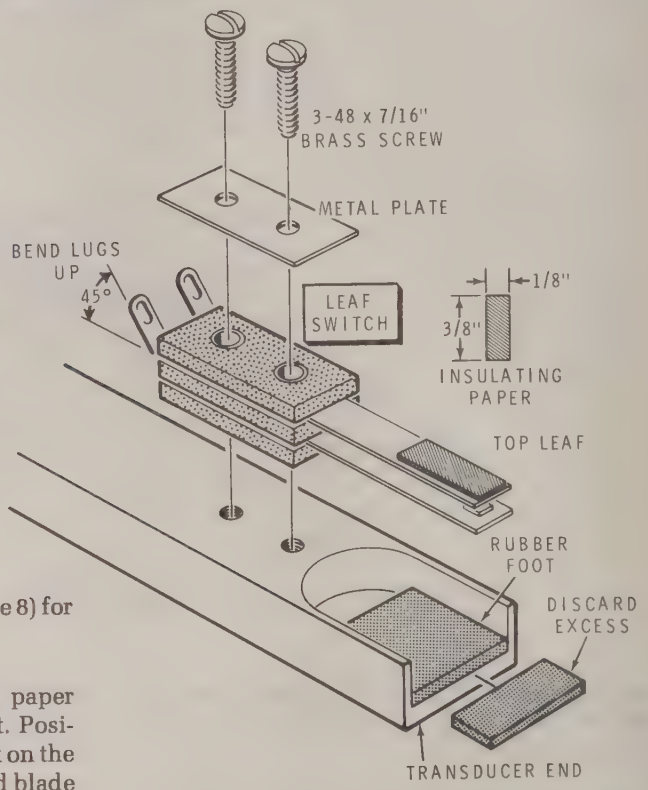
NOTE: Before you proceed, refer to "Display" on Page 46 to determine which "tenths" readout you would like your scale to display. Then connect the jumper wire to the correct connector pin.

( ) Remove the #4 × 1-1/8" hardware from the cabinet bottom.

( ) Install the display cabinet top onto the display cabinet bottom with the four #4 × 1-1/8" screws. Tighten the screws, then loosen each screw 1/2 turn. This will prevent bowing of the cabinet top causing the LED's to push against the window.

This completes the "Adjustment" proceed to "Final Assembly."

FINAL ASSEMBLY



Detail 3-12A

Refer to Pictorial 3-12 (Illustration Booklet, Page 8) for the following steps.

( ) Refer to Detail 3-12A and remove the paper backing from the remaining rubber foot. Position the rubber foot as shown and press it on the end of the transducer. Use a sharp-edged blade and cut the excess section off. Discard the excess section.

( ) Refer to Detail 3-12A and cut a piece of insulating paper as shown. Remove the paper backing from the prepared insulating paper and press it onto the leaf switch.

( ) Remove the tape or rubber band holding the leaf switch sections together. Hold the switch sections together and mount the leaf switch on the transducer with two 3-48 × 7/16″ brass screws. Keep the leaf switch, and the two switch leafs, parallel with the transducer.

( ) Bend the leaf switch **lugs** (not the leaf) up approximately 45° as shown.

( ) Cut an 8″ length of multicolored 8-wire cable and separate it into a brown and red 2-wire cable.

( ) Separate the wires at the ends of the 2-wire cable for a distance of 3/4″ and prepare the wire ends.

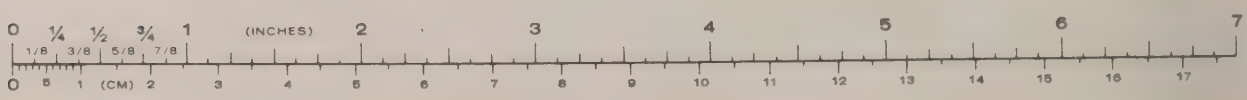
( ) Remove one of the batteries from the left battery compartment.

Connect the 2-wire cable as follows:

( ) One end of the brown wire to terminal strip AJ lug 2 (S-2) and the other end to switch SW1 lug 2 (S-1).

( ) Connect one end of the red wire to terminal strip AJ lug 3 (S-1) and the other end to switch SW1 lug 1 (S-1). Discard any remaining cable.

( ) Cut two 1/4″ lengths of small sleeving.



( ) Locate the lever arms and remove them from their package. Note that the arms have a lubricant on them. Do not remove this lubricant.

( ) Refer to Detail 3-12B and install a 3/16" length of small sleeving over the long lever arm pin as shown in inset drawing #1. NOTE: If the sleeving fits tight, use a pair of pliers to push the sleeving all the way on the pin. The end of the pin should be visible as shown is inset #1.

( ) In the same manner, install the remaining 3/16" length of sleeving over the other long lever arm pin.

NOTE: In the following step you will need two pair of pliers.

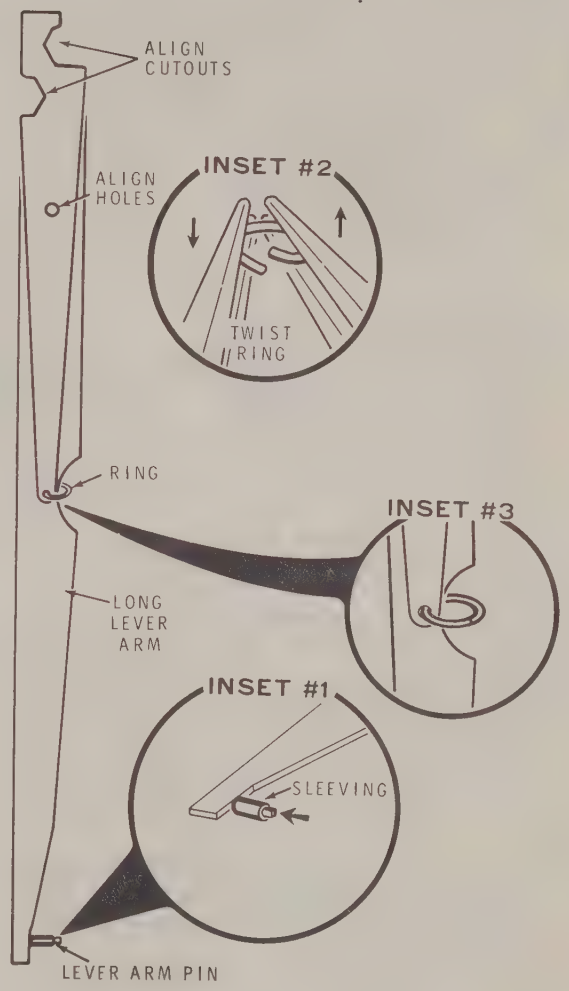
( ) Refer to Detail 3-12B and twist the ring opening with the two pair of pliers as shown in inset drawing #2. Make the opening just large enough to fit through the holes in the lever arms.

( ) Place the small lever arm over the large lever arm. Align the holes and cutouts in both pairs of lever arms as shown in Detail 3-12B and install the ring in the lever arm holes.

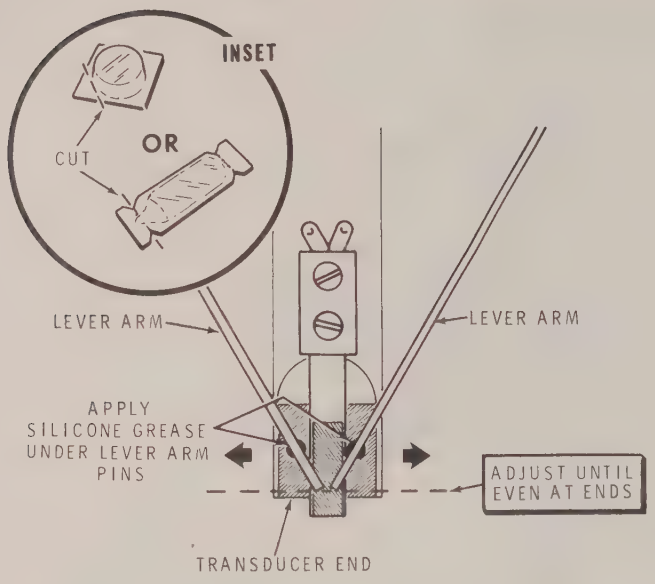
( ) Close the ring opening with the pliers as shown in inset #3.

( ) In the same manner, install the remaining ring in the other pair of lever arms.

( ) Install both pair of lever arms in the platform bottom as shown.



Detail 3-12B



Detail 3-12C

Refer to Detail 3-12C and look at the ends of the lever arms to see if they are even. If the ends are even, disregard the following three steps. If the ends are not even, perform the following three steps.

1. ( ) Slightly loosen the transducer mounting screws.

2. ( ) Move the indicated end of the transducer in either direction as indicated by the arrows until the lever arm ends are even.

3. ( ) Retighten the transducer mounting hardware.

( ) Refer to Detail 3-12C and apply a small amount of silicone grease under the lever arm pins as shown. Open the silicone grease pod as shown in the inset drawing.

( ) Reinstall the battery you removed from the left battery compartment.

( ) Install the platform top on the platform bottom as before.

( ) Place the AUTO/MANUAL switch in the MANUAL position.

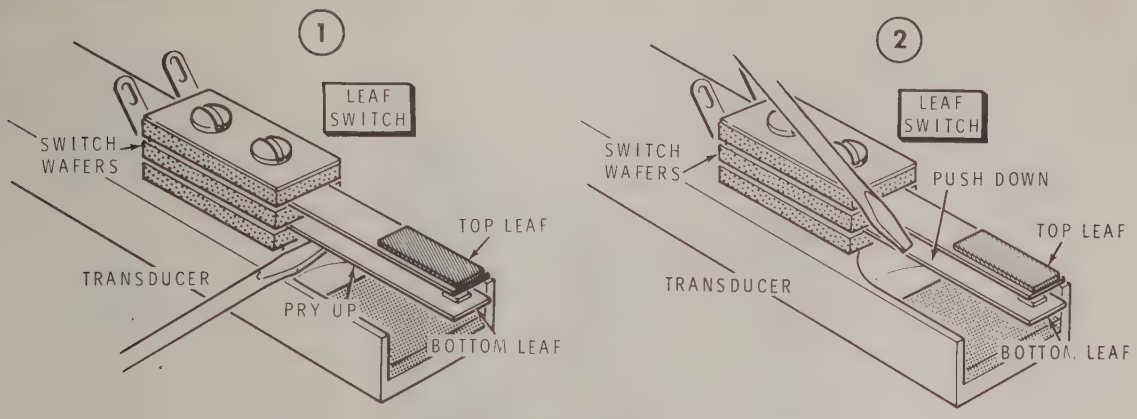
( ) Use a small-bladed screwdriver to adjust the coarse ZERO control, at the rear of the display cabinet bottom, for an approximate zero reading (999.0 to 001.0). NOTE: This adjustment insures a range of 20 pounds (9 kilograms) "tare" for the front ZERO control.

( ) Adjust the fron ZERO knob for a zero reading on the displays.

( ) Place the AUTO/MANUAL switch in the AUTO position.

( ) Slowly apply pressure on the platform until the display turns on. Note the reading at this point. This reading is the "turn-on" sensitivity of the scale.

If you would like to change the turn-on sensitivity of your scale, refer to the following "Adjustment Turn-on Sensitivity." If you are satisfied with the turn-on sensitivity, there is no need to perform these adjustments; proceed to "Final Platform Mounting" on Page 43.



Detail 3-12D

ADJUSTMENT OF TURN-ON SENSITIVITY

Use either one of the following two sections. "Increase Sensitivity" or "Decrease Sensitivity", to complete this adjustment. If you do not intend to adjust your scale, proceed to "Final Platform Mounting."

Increase Sensitivity

NOTE: In the following steps, you will increase (less weight required to turn the displays on) the turn-on sensitivity of your scale.

( ) Remove the platform top from the platform bottom. Then temporarily move the end of the left lever arm from the transducer to the cabinet bottom.

( ) Refer to Detail 3-12D, Part 1, and place a small screwdriver blade between the top of the transducer and the bottom leaf of the leaf switch, near the switch wafers. Bend the bottom leaf up slightly to bring the switch contacts closer together.

( ) Place the end of the left lever arm back in position on the end of the transducer and replace the platform top on the platform bottom. Check the turn-on sensitivity and repeat the procedure if necessary.

This completes the "Increase Sensitivity" procedure. Proceed to "Final Platform Mounting."

Decrease Sensitivity

NOTE: In the following steps, you will decrease (more weight required to turn the display on) the turn-on sensitivity of your scale.

( ) Remove the platform top from the platform bottom. Then temporarily move the end of the left lever arm from the transducer to the cabinet bottom.

( ) Refer to Detail 3-12D, Part 2, and place a small screwdriver blade between the top and bottom leaves of the leaf switch, near the switch wafers. Press down on the bottom leaf and widen the spacing between the contacts.

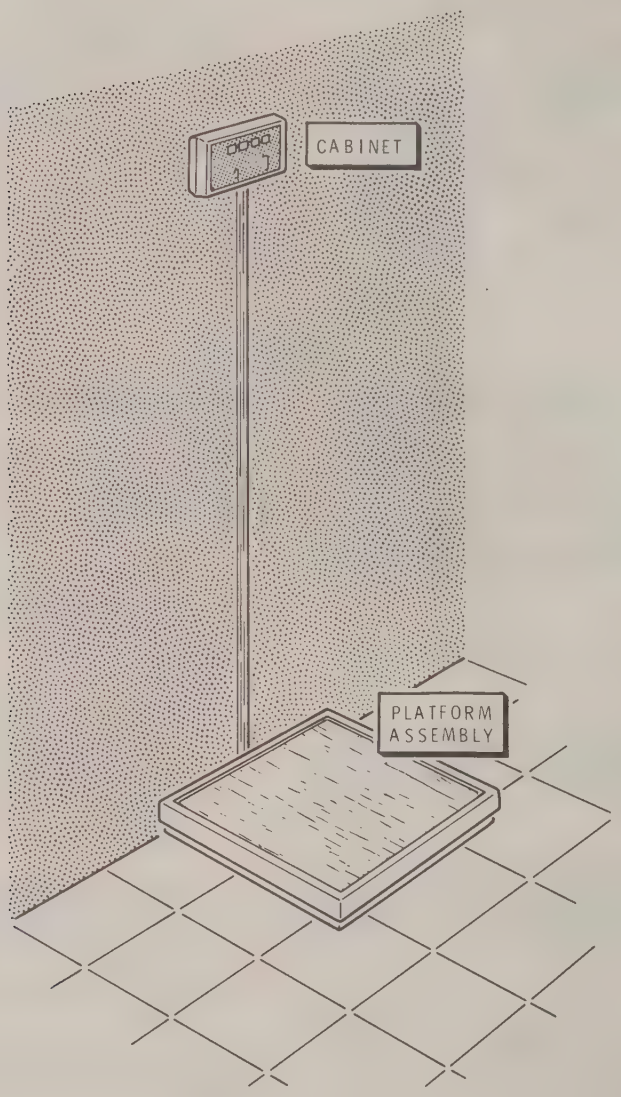
( ) Place the end of the left lever arm back in position on the end of the transducer and replace the platform top on the platform bottom. Check the turn-on sensitivity and repeat the procedure if necessary.

This completes the "Decrease Sensitivity" procedure. Proceed to "Final Platform Mounting."

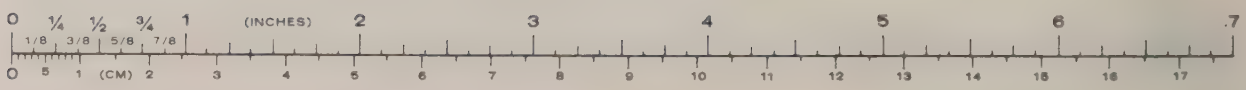
FINAL PLATFORM MOUNTING

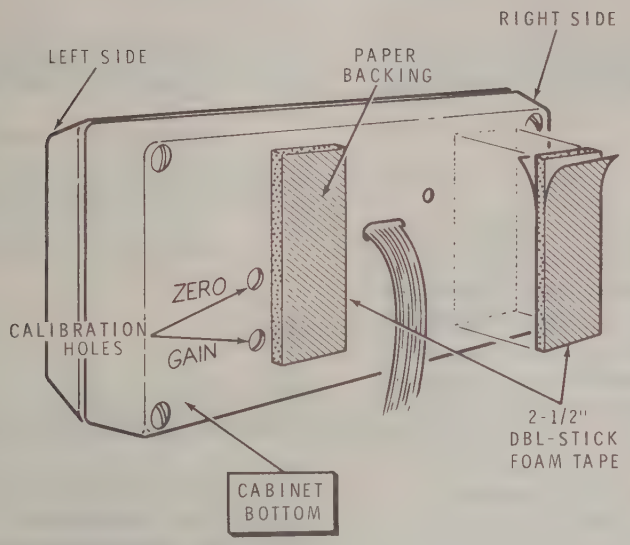
( ) Tilt the platform assembly only enough to turn the four clamps 90° as shown in the inset drawing of Pictorial 3-12.

For floor mounting, this completes the "Final Assembly" of your Digital Scale; disregard the following five steps and proceed to "Operation." If you intend to mount the display cabinet on a wall, perform the following five steps.



PICTORIAL 3-13





Detail 3-13A

WALL MOUNTING

Refer to Pictorial 3-13 for the following steps.

1. ( ) Locate the double-stick foam tape and cut it into two 2-1/2" lengths.

NOTE: Do not cover the calibration holes when you perform the following step.

2. ( ) Refer to Detail 3-13A and remove the paper backing from one length of the double-stick foam tape. Press the tape onto the left side of the display cabinet bottom.

3. ( ) In the same manner, install the remaining length of double-stick foam tape onto the right side of the display cabinet bottom.

4. ( ) Position the platform assembly in its predetermined location.

5. ( ) Remove the remaining paper backing from both lengths of double-stick foam tape and press the display cabinet onto its predetermined location. NOTE: It may be necessary to rezero the front ZERO control.

This completes the "Wall Mounting." Proceed to "Operation."

OPERATION

Refer to Pictorial 4-1 (Illustration Booklet, Page 9) for a brief description of the controls and displays for your Digital Scale.

AUTO/MANUAL SWITCH

Normally, the AUTO/MANUAL switch should be left in the AUTO position. When you step on the platform, power is automatically applied and the displays will indicate your weight. Power will not be automatically applied with any weight less than the turn-on sensitivity; it will then be necessary to manually turn the displays on. To do this, place the AUTO/MANUAL switch to the MANUAL position. With the switch in the MANUAL position, the displays will remain lit and the batteries will discharge. Do not leave the switch in the MANUAL position any longer than necessary.

ZERO CONTROL

The front ZERO control provides a fine adjustment for zeroing your scale. To zero the scale: place the AUTO/MANUAL switch to MANUAL and turn the zero knob until each of the four displays reads zero; then place the AUTO/MANUAL switch back to AUTO.

Occasionally check to make sure the scale is zeroed.

Tare

Measuring the contents of a container, but not the container itself, is known as "tare." For a "tare" measurement, perform the following:

1. Place the AUTO/MANUAL switch to the MANUAL position.
2. Place the empty container in the center of the platform.
3. Adjust the front ZERO knob until each of the four displays reads zero.
4. Add the contents to the container and read the contents weight on the display.
5. Remove the container from the platform.
6. Rezero the scale with the front ZERO knob.
7. Place the AUTO/MANUAL switch to AUTO.

DISPLAY

NOTE: When you first use the scale, allow 3 to 4 seconds for the reading to stabilize.

The tenths digit will display in .1 increments (.1-.2-.3-etc.) or in .2 increments (.2-.4-.6-etc.). This is determined by the position of the jumper wire on the display circuit board (connector AA for .1 or connector AB for .2). Normally, the jumper wire should be connected to AB. When you measure non-stationary (body) weight, several factors can cause the tenths digit to change back and forth; movement on the platform, how and where the weight is placed, and whether the floor is flat and level. This digit change is less noticeable when the display reads every two numbers (.2) than every one (.1). When you weigh stationary items, the .1 display may be more desirable.

You can leave the tenths digit blank (so it will not light) by removing IC104. The display will then read only whole numbers but they will not be rounded off. For example, if you weigh 165.8 pounds, the display will read 165, not 166.

You can read the weight displayed on your Digital Scale in pounds or in kilograms, depending on your original wiring. If you desire to change your display at a later time, refer to Pictorial 1-3 and change resistor R21 or the jumper wire as directed. Then follow the "Adjustments" procedure and recalibrate your scale using the number you recorded on Page 38.

NOTE: Due to the mechanical function in your Digital Scale, the repeatability will vary ±.5% of the reading. This means, if you stand on the platform, get off and back on again, the two readings may not agree. They may vary .5% from each other. However, as the scale "breaks in," these variations will become less. The scale is not affected by most carpeting.

LOW BATTERY INDICATOR

The low battery indicator (LO BAT) will light to indicate that only a small percentage of the batteries' charge is left. However, the displayed weight will still be correct for several more operations. The purpose of the indicator is mainly to let you know when it is time to install fresh batteries.

The battery contacts can be coated with a thin film of silicone grease to reduce the chance of corrosion. Use the silicone grease supplied with your kit.

BATTERY LIFE

Typically, dry cell battery life is approximately one year. This assumes two operations per day, each day of the year. Alkaline batteries offer twice as much operating time as standard dry cells. The current drain from the batteries is approximately the same as a flashlight.

CLEANING

Both the display inlay and the window are made of vinyl and the platform is baked enamel. Use any detergent or vinyl cleaner when you clean them. Do not use abrasive cleansers.

IN CASE OF DIFFICULTY

This part of the Manual provides you with information that will help you locate and correct difficulties which may occur in your Digital Scale. This information is divided into two sections. The first section, "General," contains suggestions of a general nature in the following areas:

- Visual check and inspection.
- Precautions to observe when bench testing.

The second section, "Troubleshooting," contains a series of "Conditions" and "Possible Causes." Start your troubleshooting procedure by first reading the following "General" section. Then proceed to the appropriate "Condition" and "Possible Cause."

GENERAL

Visual Checks

1. About 90% of the kits that are returned for repair do not function properly due to poor soldering. Therefore, you can eliminate many troubles by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Assembly Notes." Reheat any doubtful connections and be sure all the wires are soldered at places where several wires are connected. Check carefully for solder bridges between circuit board foils.
2. Check to be sure that all transistors and IC's are in their proper locations, and are installed correctly.
3. Check the value of each part. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and as called out in the wiring instructions. It would be easy, for example, to install a 2200 Ω (red-red-red) resistor in a step that calls for a 220 Ω (red-red-brown) resistor.
4. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as you check it. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.
5. Check all component leads connected to the circuit boards. Make sure the leads do not extend too far through the circuit board and make contact with other connections or parts.
6. Check all of the wires that are connected to the circuit boards or terminal strip to be sure the wires do not touch the platform bottom or other lugs. Make sure all wires are properly soldered.
7. If the difficulty still is not cured, read the "Precautions for Bench Testing" section, and the section titled "Troubleshooting."

Precautions for Bench Testing

- Be cautious when testing transistors and integrated circuits. Although they have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage and current than other circuit components.

- Be careful so you do not short any terminals to ground when you make voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it may damage one or more components.

Do not remove any components or circuit boards while the Digital Scale is turned on.

When you make repairs to the Digital Scale, make sure you eliminate the cause as well as the effect of the trouble. If, for example, you find a damaged resistor, make sure you find out what (wiring error, etc.) caused the resistor to become damaged. If the cause is not eliminated, the replacement resistor may become damaged when the scale is put back into operation.

Refer to the "X-Ray Views," "Identification Charts," and the "Schematic Diagram" to locate the various components.

Use a high impedance voltmeter and an oscilloscope to make the specified measurements in this section.

In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your warranty is located inside the front cover.

SHIPPING

IMPORTANT: If it is necessary to ship the Digital Scale to Heath Company or to a Heathkit Electronic Center, remove the batteries and the lever arms from inside the platform. Detach the support bracket from the platform and wrap it in paper or packing material. Wrap the lever arms and both platform halves all separately to protect the finish and prevent them from being damaged during shipment. Store the support bracket hardware in a safe place so you do not lose it. **DO NOT** allow any hardware to come in contact with the fine strain-gauge wires or damage may occur.

Troubleshooting Chart

This chart lists the "Condition" and "Possible Cause" of several malfunctions. If a particular part or parts are mentioned (Q1 for example) as a possible cause, check that part to see if it was installed and/or wired correctly. It is also possible, on rare occasions, for a part to be faulty and require replacement.

In addition to the following chart, also refer back to the charts in the "Calibration" section of the Manual for additional information.

CONDITION	POSSIBLE CAUSE
No number displayed; no light.	1. Battery or batteries. 2. IC6, Q1, Q201, and associated circuits. NOTE: If IC6 is suspect, interchange with IC5.
One of the segments of a digit is not lit.	1. LED or associated IC (101, 102, 103, 104.) NOTE: Interchange the suspected bad IC with a known good IC.
One or more of the four digits does not light.	1. LED or associated IC's (101, 102. 103, 104). See above note.
Decimal point does not light.	1. LED, R122.
Low battery indicator is lit; fresh batteries installed.	1. Check batteries for polarity. 2. Q101, IC1D and associated circuits. 3. R29, 31, and 32.
Reading varies more than one count after being on more than 4 to 5 seconds with no weight applied.	1. Batteries (if LO BAT is on). 2. C8, C9, C12, ZD1, IC6, R14, R134.
Weight varies more than specified limits with weight on platform.	1. Lever arms bent. 2. Binding at contact point on transducer. 3. Damaged pivots.
Scale does not come on in AUTO position, or stays on and will not shut off.	1. Check leaf switch for bent contacts. 2. Sleeving not covering pins on lever arms properly. 3. Sleeving too long on lever arm pins.
Scale does not read correct weight.	1. Lever arm is not positioned properly at end of transducer. See Detail 3-12C, Page 42. 2. Transducer and associated wiring.

SPECIFICATIONS

Display	4-digit, .5″ character LED. Low battery indicator LED.
Display Update Rate	Approximately 1 second.
Full Scale	300 pounds (136 kilograms).
Resolution	1 part in 3000.
Accuracy	±1% or ±1 count, whichever is greater.
Repeatability	±.5% of reading or ±1 count.
*Overload Capacity	50% of full capacity.
Primary Controls	Zero (tare adjust 20 pounds typical). Platform switch. ON-Off (Manual/Auto) switch.
Operating Temperature Range	32° to 122°F (0 to 50°C). Requires readjustment of zero control.
Secondary Controls	Coarse Zero. Gain. Jumper for selecting .1 or .2 pounds.
Platform	Die cast aluminum with vinyl inlay. 11-1/2″ long × 11-1/2″ wide × 1-5/8″ high. (29.21 × 29.21 × 4.13 cm).
Cabinet Size	6″ long × 3-1/2″ wide × 1-1/2″ high. (15.24 × 8.89 × 3.81 cm).
Net Weight	5.4 pounds (2.4 kilograms).
Transducer	Foil strain gauges (bridge configuration).
Power Requirements	Six "C" type dry cell or alkaline batteries.
Current Drain	250 mA (approximately).

*Reduced accuracy above 300 lbs. Scale will reach stops at approximately 350 lbs. Not damaged by weight up to 450 lbs.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-in) and the Block Diagram (Illustration Booklet, Page 9) as you read this "Circuit Description."

The Digital Scale circuitry consists of three basic sections: the transducer (or sensor), the analog to digital converter, and the display circuits.

The transducer consists of a metal beam with deflection-sensing strain gauges bonded to it. When you apply a weight to the transducer, it deflects and causes the strain gauges to change resistance. The resistance change is converted into voltage and amplified. The amplified voltage is converted from an analog signal into digital form by the A to D (analog to digital) converter stages. The digital signal is fed to the decoder drivers and finally to the LED displays.

INPUT

The input stage consists of the transducer and an amplifier. The transducer consists of a metal beam with four strain gauges (SG201 through SG204) bonded to it. Each strain gauge is constructed of a fine metal foil made of a special alloy. The strain gauges are arranged in a grid pattern and connected to the metal beam in a bridge configuration. As you apply weight to the scale, the transducer deflects, and the strain gauges change resistance. This resistance change unbalances the bridge and develops a voltage, which is applied through resistors R17 and R18, to the inputs at pins 2 and 3 of amplifier IC3. A voltage difference between pins 2 and 3 of amplifier IC3 is amplified, and is present at its output, pin 6. The gain of amplifier IC3 is set by resistors R19, R21 and R24. Capacitors C6 and C7 minimize any input lead noise. Capacitor C8 sets the frequency response and reduces any power supply noise. Control R14 and resistor R16 compensate for unbalances in the input circuit.

A TO D CONVERTER

The A to D converter consists of four basic stages: the integrator, comparator, oscillator and counters. Other circuits contribute to these stages; they will also be discussed, along with the above, at the proper time. The A to D converter applies the dual slope (ramp down and ramp up) technique to convert the analog (input) voltage into digital form.

Integrator

Integrator IC5 has two inputs which control the state of its output. One input receives the input voltage, while the other input remains fixed. The fixed input provides a reference level for switching the output to either a high or a low state. A time constant is provided for IC5 which causes its output to ramp down or up as shown in Pictorial 5-1 (Illustration Booklet, Page 9). When the input voltage is higher than the reference voltage, the output ramps down. When the input voltage is less than the reference voltage, the output ramps up.

Comparator

Comparator IC1A operates the same as integrator IC5. It has two inputs, one that is fixed at a reference level, which control the state of its output. Its output does not ramp up and down, however. It is either at a high or a low state, since no time constant is involved.

Oscillator

Oscillator IC1B provides a standard of measurement for counters IC105 and IC106. IC1B is a free running oscillator which provides a continuous series of pulses to the counters. The operating frequency is set by resistors R9, R11, R12, R13 and capacitor C5.

Counters

IC105 and IC106 make up four decade counters. The first decade counter at IC106 receives pulses at its input from the free running oscillator, IC1B. When IC106 counts nine pulses and starts counting the tenth, a pulse at its output is transferred to the input of the second decade counter, also at IC106. When the second decade counter reaches the 9-to-0 transition, a pulse is transferred from its output to the input of the third decade counter at IC105. The 9-to-0 transition continues for each remaining decade counter. The first counter provides count information for the tenths display; the second counter, units; the third, tens; and the fourth, hundreds.

WEIGHT ON THE SCALE

The following sequence of events takes place when weight is applied to the scale.

As weight is applied on the platform top, the transducer deflects. The four strain gauges (SG201 through SG204), which are connected in a bridge configuration, become unbalanced and a voltage is developed. This voltage comprises the analog input voltage, which is applied to the inputs at pins 2 and 3 of amplifer IC3, where it is amplified. The output at pin 6 of IC3, is applied to switch IC4B at pin 3. At this time, switch IC4B is closed and IC4C is open. The signal voltage passes through IC4B and goes to the input at pin 2 of integrator IC5. The heavier the weight applied to the scale, the more positive the input voltage at pin 2 will be. The input voltage at pin 2 is higher than the reference voltage at pin 3; therefore, the output at pin 6 of integrator IC5 begins to decrease (ramp down) at a constant rate.

Oscillator IC1B provides a continuous series of pulses for decade counters IC105 and IC106 to count. At the time the output of integrator IC5 begins its down ramp, counters IC105 and IC106 begin at 0 to count the oscillator pulses. When the counters reach the 7999 to 8000 transition, a positive control pulse at pin 6 of counter IC105 is coupled through capacitor C1 to the set input at pin 8 of flip flop IC2B. This switches the $\overline{Q}$ output at pin 12 of IC2B to a low state, which opens switch IC4B and disconnects the signal voltage from the input at pin 2 of integrator IC5. The Q output at pin 13 of IC2B is switched to a high state, which closes switch IC4C and places the input at pin 2 of IC5 to ground. The input at pin 2 of integrator IC5 is now at a lower potential than the reference voltage at pin 3, and the output at pin 6 of integrator IC5 starts its up ramp.

Counters IC105 and IC106 continue to count up from 8000 until the up ramp voltage at pin 6 of integrator IC5 crosses the threshold (fixed) voltage at pin 4 of comparator IC1A. At that point, a positive pulse from the output at pin 2 of IC1A is applied to the reset input at pin 10 of flip flop IC2B. This changes the $\overline{Q}$ output at pin 12 back to a high state and the Q output at pin 13 to a low state. Switches IC4C and IC4D switch back to their original states. At the same time, the number of pulses in counters IC105 and IC106, are transferred to the latches at IC's 101 through 104. There they are held and displayed. These displayed numbers are directly proportional to the input voltage at pin 2 of integrator IC5.

The positive pulse from pin 2 of comparator IC1A is also coupled to the reset input at pin 4 of another flip flop, IC2A. This flip flop synchronizes the output at pin 2 of comparator IC1A with the output pulses at pin 1 of the free running oscillator IC1B. This allows control of the latch inputs, at pin 5 of the latching IC's 101 through 104, only when the output at pin 1 of oscillator IC1B and the output at pin 2 of comparator IC1A are in their high states. The $\overline{Q}$ output at pin 2 of IC2A cannot go high until both its reset and clock inputs (pins 4 and 3) are high. This minimizes variations in the tenths count display.

The negative-going portion of the pulse at pin 2 of comparator IC1A is coupled through capacitor C12 to momentarily open switch IC4D. This allows a positive pulse from pin 11 of IC4D to reset pins 7 and 15 of counters IC105 and IC106, which clears them (return to 0).

This completes the analog to digital conversion cycle. As soon as counters IC105 and IC106 are cleared, they begin counting up again from 0. At the same time, the output at pin 6 of integrator IC5 starts its down ramp as before, and the conversion cycle begins again.

NO WEIGHT ON THE SCALE

With no weight applied to the platform top, the display reads 000.0. This occurs in the following manner:

Since the up ramp output at pin 6 of integrator IC5 starts with counters IC105 and IC106 at 8000, they will continue to count up from 8000 to 9999, the next number being 0000. The input voltage at pin 2 of integrator IC5, is adjusted by the front Zero control, R14, so that the up ramp at pin 6 of integrator IC5 crosses comparator IC1A's threshold level when counters IC105 and IC106 are at 0000. Therefore, if the Zero adjust control is set one count (.1 lb.) below 0000, the display will read 999.9. If the Zero adjust control is set one count above 0000, the display will read 000.1.

LOW BATTERY INDICATOR

IC1D compares the battery voltage with the voltage present at the junction of resistors R31 and R32. When the battery voltage becomes low enough, such that the voltage at the junction of resistors R3 and R4 reaches the threshold level at pin 11 of IC1D, the output at pin 13 goes to a low state and turns transistor Q101 on. This lights the LED at pin 5 of V101.

POWER SUPPLY

The power supply source voltage is obtained from six "C" cell batteries which provide 9 volts to the regulator. The regulator consists of IC6, Q1, Q201 and their associated circuits. The output voltage at the collector of Q1 is sampled by resistors R37 and R38. The voltage at the junction of these resistors is compared with the zener voltage at ZD1. Any difference between these voltages is amplified by IC6 and applied to the base of transistor Q1 through resistor R41. Transistor Q1 is controlled in such a way that its output is always constant. This regulated output provides the necessary regulation for the input circuits and the A to D converter. Transistor Q201 provides regulation for the display circuits. The control voltage for Q201 is obtained from the constant collector voltage at Q1.

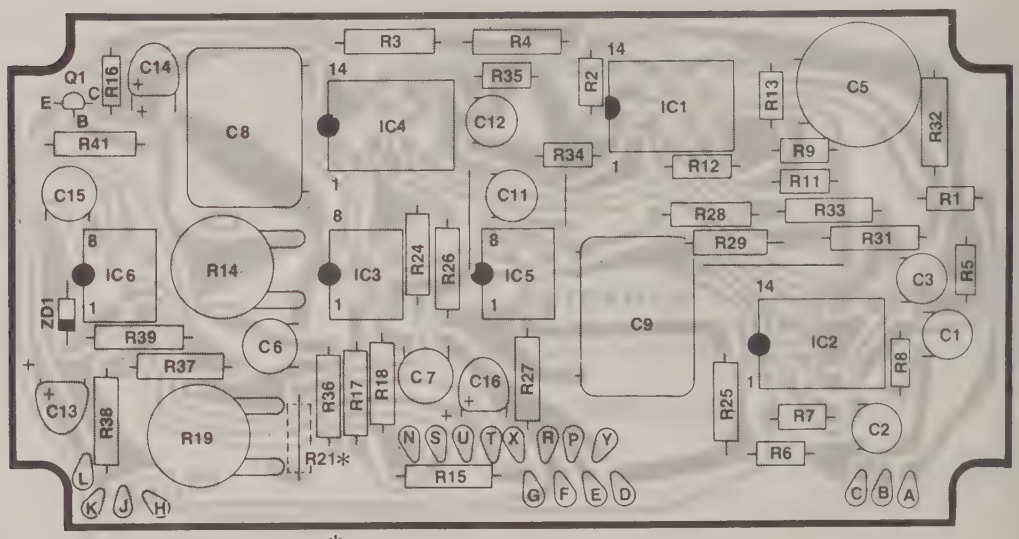
CIRCUIT BOARD X-RAY VIEWS

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

A. Find the circuit component number (R5, C3, etc.) on the "X-Ray View."

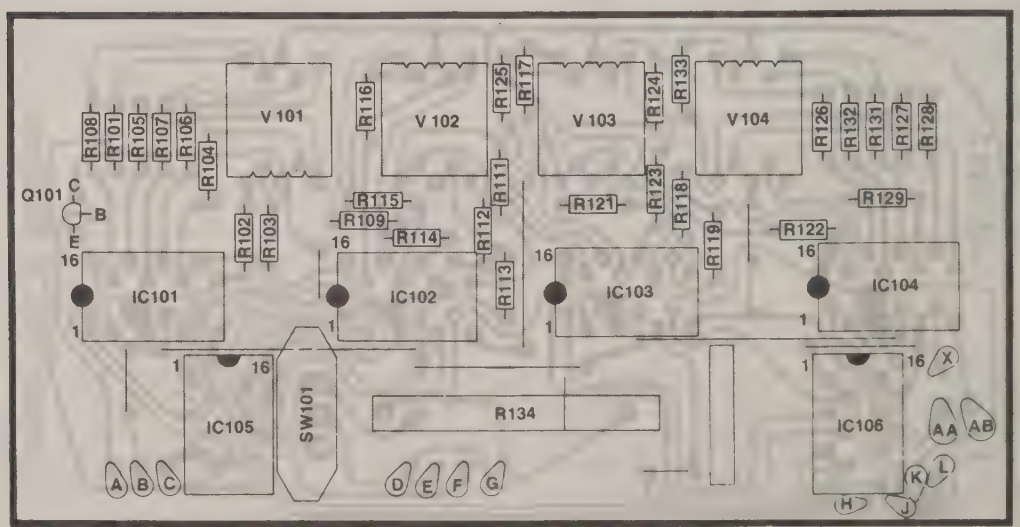
B. Locate this same number in the "Circuit Component Number" column of the "Parts List."

C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



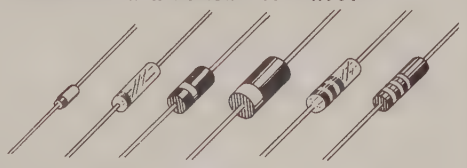
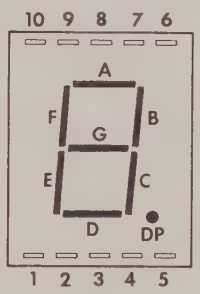
*OPTIONAL

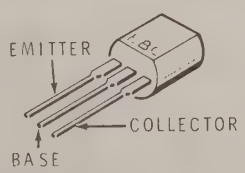
A TO D CIRCUIT BOARD
(VIEWED FROM COMPONENT SIDE)

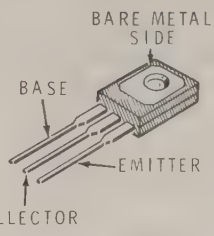
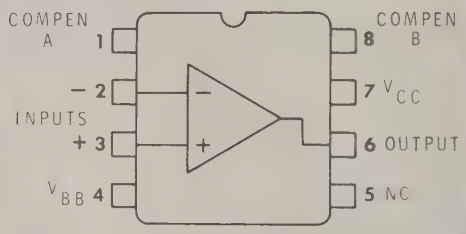
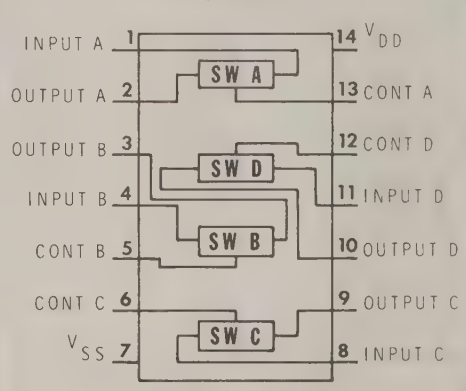
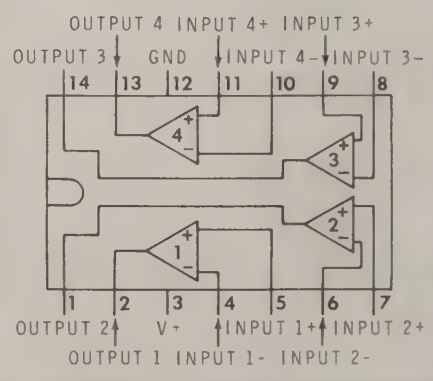


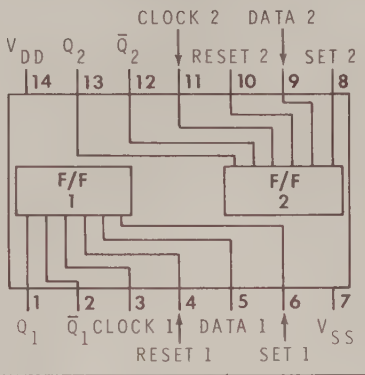
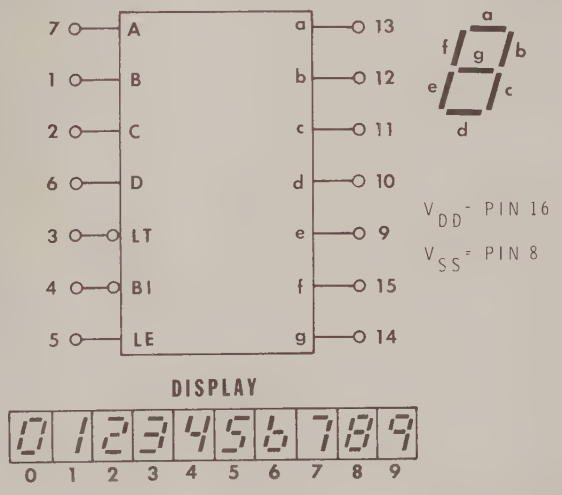
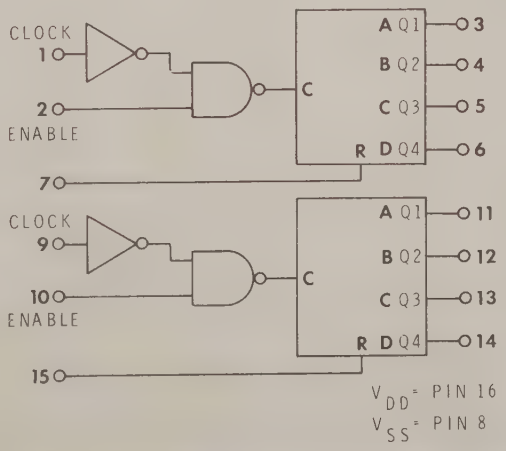
DISPLAY CIRCUIT BOARD
(VIEWED FROM COMPONENT SIDE)

Semiconductor Identification Charts

<table>
<tr><th>COMPONENT</th><th>HEATH PART NUMBER</th><th>MAY BE REPLACED WITH</th><th>IDENTIFICATION</th></tr>
<tr><td>ZD1</td><td>56-613</td><td></td><td>IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.
  </td></tr>
<tr><td>V101, V102, V103, V104</td><td>411-819</td><td>FND-500</td><td>PIN CONNECTIONS
(TOP VIEW)
 

<table>
<tr><th>PIN</th><th>FND500</th></tr>
<tr><td>1</td><td>SEGMENT E</td></tr>
<tr><td>2</td><td>SEGMENT D</td></tr>
<tr><td>3</td><td>COMMON CATHODE</td></tr>
<tr><td>4</td><td>SEGMENT C</td></tr>
<tr><td>5</td><td>DP</td></tr>
<tr><td>6</td><td>SEGMENT B</td></tr>
<tr><td>7</td><td>SEGMENT A</td></tr>
<tr><td>8</td><td>COMMON CATHODE</td></tr>
<tr><td>9</td><td>SEGMENT F</td></tr>
<tr><td>10</td><td>SEGMENT G</td></tr>
</table></td></tr>
<tr><td>Q1, Q101</td><td>417-235</td><td>2N4121</td><td> 
</td></tr>
</table>

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	IDENTIFICATION
Q201	417-818	MJE181	
IC5, IC6,	442-66	LM308N	TOP VIEW 
IC3	442-639	LM308AN	
IC4	442-99	CD4016	TOP VIEW 
IC1	442-616	LM3302N LM2901N, or UA775	TOP VIEW 

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	IDENTIFICATION
IC2	443-607	CD4013AD	TOP VIEW 
IC101, IC102, IC103, IC104	443-699	MM14511	
IC105, IC106	443-737	MC14518	

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this form. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # _____ Invoice # _____

Date Purchased _____ Location Purchased _____

LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUT ALONG DOTTED LINE

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this form. COD ☐

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ADDRESS _____

CITY _____

STATE _____ ZIP _____

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TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

Schlumberger

MP MASTER

MA22775

HEATH COMPANY • BENTON HARBOR, MICHIGAN

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

LITHO IN U.S.A.